THE HEATING AND VENTILATING MAGAZINE

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THE TRUE RELATIONS BETWEEN UNIONS AND EMPLOYERS

BY "MANUFACTURER"

A fellow manufacturer in a western city years ago stated that it was his policy to give his men higher pay than any similar grade of workman received in that city and higher than men received from any other manufacturer in that line of work in the country. If a man left without cause and went to a competitor he was not blacklisted, but when he came back looking for work he got it if he was a good man and if there was a vacancy. If he was an exceptionally good man work was found for him if possible, without regard to existing vacancies.

That would seem to be about the ideal labor condition. There are many manufacturers to-day who have the same disposition and are disposed to pursue a similar policy so far as it is permitted by the unions. They like, however, to be free to pay such wages as business justifies and no more; to pay men according to their efficiency and value; to hire any good man they can get without regard to organization affiliations and to discharge any man when they can no longer profitably use his services.

This is just what the unions object to because it practically means "the open shop," and it is their contention that the open shop means the death of the unions. There is no reason in the world why it should, unless the unions make it necessary. If it is the object of the unions to antagonize the interest of their employers then there is no question but that they must either be exterminated or else control the industrial situation absolutely. Employers must not only pay whatever wages the unions dictate, without regard to services rendered, but they can hire and discharge men only with the consent of the union.

That would make it impossible for any one to carry on business unless the union leaders should happen to know more about his business than he did—a condition which is not likely to exist very often.

But it has occurred to many that there is a different function of the unions, one which would make their existence and prosperity beneficial to their employers as well as to their members.

It would seem not at all impossible for them to establish a standard of efficiency as necessary to membership.

Under such conditions it would speedily become apparent to employers that the best men for them to have around would be union men; probably they would even consider them indispensible to the proper conduct of their business. They would want them because of their superior intelligence and ability, which would mean the highest productive power as regards both quantity and quality of work, and because with such unions they could maintain relations that would give them a definite basis on which to make their calculations.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

SEMI-ANNUAL MEETING

The summer meeting of the American Society of Heating and Ventilating Engineers was held as previously announced, at the Hotel Cadillac, Detroit, Friday and Saturday, July 15 and 16.

The weather was perfect and the attendance the best of any summer meeting in the Society's history; the papers were well received and both they and the various topics of the programme were discussed with interest.

President Andrew Harvey called the meeting to order for its first session at 10 o'clock Friday morning. The roll call by the secretary showed a quorum present.

The secretary announced that the following persons had been elected to membership in the Society since the last meeting:

Edward S. Berry, Philadelphia.

Clifford R. Bradbury, Washington, D. C.

John S. Brennan, Milwaukee, Wis.

Louis Courtot, Dole (Jura), France.

William H. Driscoll, Jersey City, N. J.

Oliver Miller, Warrensburg, Mo.

Edward K. Munroe, Baltimore.

Ambrose O. Neal, New York.

Herbert W. Nowell, New York.

Ernest C. F. Von der Lippe, St. Louis, Mo.

Alex. Zeck, Grafton, W. Va.

Howard T. Gates (Associate), New York.

Edmund Schlemmer (Junior), Cincinnati.

President Harvey introduced Hon. T. E. Tarsney, Corporation Counsel of Detroit, as representative of the Mayor, who was unavoidably absent. Mr. Tarsney made an effective address of welcome, which was responded to by F. K. Chew.

Secretary Mackay then read the following paper, in the absence of the author:

A Review of Some Heating Literature

By Hugh J. Barron

As my paper read at the January (1904) meeting covered a reference to the work scattered through the proceedings of the Master Steam Fitters' Association, and incidentally referred to the papers read before the British Institution of Heating and Ventilating Engineers, I deem it advisable to make slight reference to the papers read at various times by engineers before the American Society of Mechanical Engineers for the benefit of students who may desire to map out for themselves a complete course in heating literature. This will also cover the recognition of the fact that our Society evolved from the American Society of Mechanical Engineers as well as from the Master Fitters' Association. The American Society of Mechanical Engineers was founded in 1880 and, in the twenty-four years elapsed, there have been some valuable discussions in reference to details of the heating art and of those branches of engineering closely related to it.

In the first volume of the Transactions of the last named society for the year 1880, there is no special matter relating to heating, but there is a valuable paper on "The Value of the Study of the Mechanical Theory of Heat," by the well-known engineer, Alfred R. Wolff.

In Vol. III (1882), there is a paper by W. T. Trowbridge, Professor of Engineering at Columbia College, which is entitled "The Determination of Heating Surface Required in Ventilating Flues."

In 1883, W. J. Baldwin contributed a paper on "Standard Cast Iron Fittings," which was ably discussed by several engineers who were present. Mr. Baldwin, I believe, advocated greater refinement and William Barnet Le Van seemed to think that the old Morris and Tasker fittings were good enough for all purposes. There are many of this way of thinking still among engineers and the "good enough" family is extremely influential as any one finds out who proposes anything new. In the same year R. H. Thurston contributed an interesting paper on "Water Hammer in Steam Pipes."

The next paper was contributed by John

W. Anderson in 1895, on "Adaptation of Steam Boilers to Warming Dwelling Houses."

In Vol. VII (1885), W. J. Baldwin contributed a paper on "Notes on the Comparative Value of Metal Surfaces for Warming Air." In the same volume is found a paper by George W. Bond on "Standard Pipe and Pipe Threads," and another interesting paper by W. T. Trowbridge on "The Relative Economy of Ventilation by Chimneys and Ventilation by Fans."

A very important report was made by a Committee on "Standard Pipe and Pipe Threads" in 1886, and is found in Vol. VIII (1886-87) of the Proceedings. In the same year, Charles E. Emery contributed a paper on "The Comparative Value of Steam and Hot Water for Transmitting Heat and Power."

Vol. IX (1887-88) contains quite a number of papers; among these may be noticed "Experiments and Experiences with Blowers," by Henry I. Snell, and another paper by the same author on "An Economical Method of Heating and Ventilating an Office and Warehouse Building." J. T. Hawkins contributed a paper on "Automatic Regulator for Heating Apparatus." Henry R. Towne contributed a paper on "A Safety Car-Heating System," and W. J. Baldwin "Notes on Warming Railroad Cars with Steam."

In Vol. XI (1889-90) there is found a paper by C. H. Peabody and J. H. Kunhardt on "Flow of Steam Through Orifices;" Prof. R. C. Carpenter in the same year, contributed a paper on "Comparative Test of a Hot Water and a Steam Heating Plant."

All that seems to be of interest in the following year are two papers on heat transmission, contained in Vol. XII, one by Prof. R. C. Carpenter on "Heat Transmission Through Cast-Iron Plates Pickled in Nitric Acid," and another by Daniel Royse on "Heat Transmission Through Plates Pickled in Nitric Acid."

The next paper of any importance is found in Vol. XV (1893-94), contributed by W. A. Pike, on "Steam Piping and Efficiency of Steam Plants."

Vol. XX (1898-99) contains a number of interesting papers which have reference generally to the mechanical plants of modern buildings. Among these may be mentioned "The Mechanical Plant of a Modern Commercial Building," by W. S. Bryan; the "Equipment of Tall Office Buildings in New York City," by Reginald Pelham Bolton; "The Central Heating Plant of the University of Wisconsin, at Madison, Wis.," by Storm Bull. In addition to these numerous papers there is one by Prof. R. C. Carpenter on "Experiments on the Flow of Steam Through Pipes."

Central station heating comes in for discussion in a paper by H. T. Yaryan on "Hot Water Heating of a Central Station," which is found in Vol. XXI (1900) of the Proceedings. This paper was discussed by George I. Rockwood.

In Vol. XXIII (1902) there is a valuable report of the Committee on "Standard Pipe Unions" and in Vol. XXIV (1903) the topical discussion on "Smoke Consumption," by E. P. Bates and Gus. C. Henning, is very interesting. The two methods of prevention of smoke are very ably discussed.

At the recent summer meeting of the Mechanical Engineers, there were two papers read, which touch upon the province of the heating engineer. These papers have reference to New York office buildings, and were contributed by James Hollis Wells and Reginald Pelham Bolton.

I have not attempted to review in detail the various papers, nor do I think it necessary, as they can be found at any public library, and a search for the heating papers through the transactions will disclose other interesting matters.

It should always be borne in mind that a number of motives are responsible for the preparation of any paper. The first and ostensible motive is the scientific spirit—the desire for the propagation of engineering facts. The second is the indirect commercial motive to obtain publicity for a certain new or pseudo new product. The third incentive is that of personal advertisement.

All of these motives are modified by the commercial instinct of prudence that no information which might be of value to a competitor should be divulged. This may be noticed in almost all papers, and in the discussion of them before nearly all engineering societies. The fact is, so-called really clever men rarely discuss papers. They take the Philistine attitude that the information which they have acquired by their personal enterprise is their own property. They forget that it is the property of the race, and that it is their duty to share it with their contemporaries and transmit it to their successors.

I think it is recognized to-day that our Society is the proper one for the discussion of problems relating to heating and ventilating engineering. Before our organization, such work was in the province of both the Mechanical and Civil Engineers' Societies. Robert Brigg's great paper was presented to the Civil Engineers of Great Britain.

I know there is a feeling among some engineers that our Society was not necessary and that the general societies covered the ground fairly well, but I am convinced that this is an entirely mistaken view and that our existence is fully justified by our work.

DISCUSSION

Mr. Chew: This is the most valuable paper that can be presented to the society, the recounting of what you have done; whether a man has heated a factory with exhaust steam, or whether he has

used a hot water system in a house or a fan system in a church; if he takes the fire surface or the grate surface and shows his use of it, he is adding new history of what he has done, which is invaluable for the guidance of men who have not worked in that field, but who may be called upon to take contracts in it.

Mr. Feldman: I know of one paper published by the American Society of Mechanical Engineers on the Central Power Plant of Columbia University, a very exhaustive paper. I want to add that paper to the rest of them.

Mr. J. T. McElfatrick, Detroit: A paper read before the American Society of Mechanical Engineers by Mr. W. H. Pierce of Chicago, at their last meeting, was valuable for every member of this organization and can be secured by writing to Mr. Pierce, 263 Dearborn Street, Chicago.

Mr. George M. Brill, Chicago: At the recent meeting of the National Electric Light Association in Boston, a paper was presented on Central Steam Heating and Hot Water Heating Plants. Perhaps more of the commercial than the technical side was presented, but it was withal a very interesting paper. I think copies of that could be obtained by addressing the secretary of the National Electric Light Association. It is the result of a series of questions sent out to a hundred different heating plants, most of them operated in connection with lighting and power plants, and brings out a great deal of valuable information.

TOPIC NO. 1

"Are the commercial demands upon the time of our members the only hindrance to the presentation of tabulated or descriptive experience of their work?"

Mr. Chew: It is up to the members here assembled to jot down what comes up to them in the course of a year that they would like to have more fully discussed. There certainly is a scarcity of papers on subjects that some of the men would like to have discussed here, and this topic was presented with the idea of having a sort of a class meeting or confessional, why you don't send in more papers or more topics for the secretary. Now is it a fact that the commercial demands on your time are so great that you have not time to tabulate your work or save a set of plans and dictate a description to the stenographer? Many of those papers might not be as scientific as you would like to present, but there is no need that they should be. When a paper comes before the society the thing you have not put in it you will be asked about.

TOPIC NO. 2

"Vacuum Systems of Steam Heating."

Mr. E. K. Munroe: I would like to ask, in regard to vacuum work, does the ejector act as a relay, or a second pump, to hold the job down to a vacuum in a first class manner, or does it maintain sufficient vacuum to make the job work? That is in Webster work. I have under consideration now a job in which one pump is specified and one ejector. Now if anything happens to that pump and they fall back on the ejector, I have not had the experience with it to know whether it would do the work. I have always had two pumps on every job I have had to do with.

Professor Hoffman: I have no real reason to offer the gentleman as to why that is done; in fact, I am rather surprised it was done. I have come in contact with a number of jobs with the Webster people, and in no case have I had anything but a double pump. For my part, I should rather prefer the two pumps to the one pump and ejector.

Mr. Munroe: The last thing I did before leaving Baltimore was to make arrangements to install in this particular job two vacuum pumps to complete that system. I would not have insisted on two vacuum pumps had I known positively an ejector would do the work.

President Harvey: Might not the ejector be intended for an auxiliary?

Mr. Munroe: Yes, it is a relay. But the point is will the ejector maintain 60 inches or more of vacuum on that system when it is being used, as a pump would positively?

Mr. A. T. Hoyt, Warren, O. (a guest): I have had a little experience with vacuum heating, which may be of interest. I am a florist and my experience is in greenhouses. They are a little harder to heat than dwellings. I have used vacuum steam and also vacuum water, and I found vacuum water superior to ordinary steam heating in grenhouses, for the reason that it does not take the fuel or the watching, and it is very easily managed. When the weather is mild a low fire gives you heat that you cannot distinguish from ordinary water heating, and by regulating your fire you can reduce the temperature to probably 100 degrees. I have left it from nine o'clock at night until four in the morning, on cold nights, and had heat in my house and greenhouses in the morning, although the fire in the boiler needed kindling. If I had used steam I would not have had any heat at all. To test the thing, I went out at four o'clock in the morning and opened a valve, broke my vacuum, and let the air in and had to fire up for an hour or two, to force the air out.

Prof. Hoffman: Might I ask the gentleman whether he uses a pump. How do you get your vacuum?

Mr. Hoyt: By firing, and forcing the air out of the pipes, and then I have an automatic valve that closes, and no air gets back into the pipes, and if I don't fire strong enough to produce 212 degrees, I am under a vacuum.

Mr. Brennan: I would like to ask how you get your vacuum in hot water?

Mr. Hoyt: By the contraction of the water.

Mr. Blackmore: That is a somewhat interesting problem, and I don't think most of us have got it through our minds yet. It appears he forms a vacuum by heating the water and making it airtight, so that when it cools and shrinks there is a vacuum made. Usually that vacuum in a hot water system appears in the form of an air trap. Now, if that circulates at a low temperature our friend has discovered something that I think has not occurred to us, viz.: that circulation in a hot water system can be produced by what he calls a vacuum. He expands the water, closes the system tight, and lets the water cool. Now, there is in a sense a vacuum there. How it affects the circulation of the water I cannot see. But if he has had experience and says it does so, I think we can discuss it to advantage. I would like to ask how low he allowed it to cool down and how rapidly it circulated. He spoke about opening a pet cock and letting the air in in one case, and it took some time to heat up. When he did not open this it heated up rapidly. I would like to have some explanation of the difference, and whether he tried it more than once. Also, I would like to know if there was anything in the nature of a tank, where he held this so-called vacuum; whether the system was a pressure hot water system, or whether there was an open tank.

Mr. Hoyt: My piping is the same as an ordinary hot water heating plant, and instead of an expansion tank, I have two twenty-foot four inch pipes placed horizontally probably four feet higher; I fill my pipes, and then when I expand my water it fills those four inch pipes. At the end of that I have an automatic valve screwed down just tight enough so that it will leak from the pressure; and then when the water expands it sometimes forces water out through that valve. Then when the water contracts, or I draw water out below, the valve will close, and then I am under a vacuum anywhere as low down as water getting cold will make it. I have had it so low that no water would come out of the bottom. I have no way of testing exactly what vacuum I have, but I could get no water out of the radiator in the house, nor out of the piping in the greenhouse. To further test it, I am up about four o'clock in the morning and have found the radiators in the house hot after leaving the fire at nine o'clock at night. Sometimes I found fire enough so that I could rebuild it with coal; other times I have to rebuild it with kindling. I fire up until in a short time my radiators and the radiation in the greenhouse shows increased heat, and if I fire strong enough, I have that valve leaking; that destroys the vacuum. Sometimes when I got up I would turn the pet cock and break the vacuum; then I would have to fire quite strong before I got the heat again.

Mr. Blackmore: Will you tell how long it took to circulate when you let the air in?

Mr. Hoyt: Just as long as it would in an ordinary hot water apparatus. When I did not break the vacuum, just as soon as my fire got to burning, the circulation increased right away, and I soon had it hot.

Mr. Blackmore: Would there be a difference of an hour, say?

Mr. Hoyt: Yes, easily an hour.

Mr. Blackmore: Did you ever try the difference in the temperature between the flow at the boiler and the return?

Mr. Hoyt: I have no hot water thermometer.

Mr. Blackmore: Could you tell approximately by feeling it how much difference there was?

Mr. Hoyt: No, I could not tell that. I intend to put on a hot water thermometer this summer, but I was running the greenhouse for my own profit, and did not care to enter into the scientific points of it, but it saves me fuel at both ends. In the morning in firing up I don't use so much fuel to get heat, and at night it lasts longer.

Mr. Blackmore: The question raised is that a vacuum in a hot water system accelerates circulation. If it does, it is a new principle we have not previously struck upon. We know that a hot water job in an open tank system will circulate more at times than at others. It may be due to good or bad drafts in the heater, to a clean or a dirty fire. And I don't want this idea to be dropped; I want to see it investigated. It is a new idea that a vacuum in a hot water system will accelerate circulation. I cannot see how it will do it, but it is worth while to give it some thought and study.

Mr. Brennan: If I understand the gentleman, he has simply a closed system of hot water heating. I don't see that there is any vacuum to that, and I don't see that he would get circulation any quicker than he would on a closed system. He may heat to a higher temperature than if he had an open system; consequently he would get more heat in his radiators. But I can't see that he saves anything. He makes a fire and lets it get down. When he makes the second fire he is where he was in the first place.

Mr. Blackmore: There is undoubtedly something in it. The moment you raise steam, when you have a vacuum, that steam is drawn toward the point of least resistance, which is toward the vacuum. Now, if you can produce a vacuum in a hot water system, at the upper portion of it, undoubtedly when the particles of that water begin to flow, they may flow toward that vacuum. Just to what extent, I

am a little puzzled, but I know that if we get the hot water to the top it will flow down quickly enough when it cools, and it is barely possible that our friend has stumbled on a principle we can afford to investigate. Why should not the circulation be quickened in a fluid like water as well as in a fluid like steam? They are both fluids, one more dense than the other. But there is a movement of the particles themselves, and, while it never occurred to me before, it might flow toward the vacuum at an accelerated speed. It is a subject I would advise the members to give thought to, so that we can drop it if there is nothing in it.

Mr. Munroe: I imagine that he has his pipes arranged in such a way that when he breaks the vacuum he creates an air pocket, which accounts for the difference in circulation, but I don't see where anything is gained. It is only a quicker circulation after you begin firing.

I think the top pipe becomes empty and there is no circulation until the water is sufficiently expanded to overcome that air pocket. When that is overcome you get the circulation you cannot otherwise, and there is absolutely nothing gained except the fact you get the circulation immediately when you have a vacuum as you call it, because the heating of the water helps to lift it over the high points.

There may be a short circuit which would take away my attempted explanation. I think it is likely that a short circuit would overcome the shortage in heat units given out by the furnace because the apparatus should start immediately through this short circuit. In either case if he had no short circuit, then I could readily see why the vacuum would assist the boiler to lift that water over the high point and start up the circulation. But he assures us that the circulation is more rapid when he does not break his vacuum. He says he saves an hour in attaining a good flow or a good circulation.

I am unable to explain the condition. The four inch pipe in my mind acts as a closed expansion tank, and I cannot see why that circulation should not begin immediately he begins to fire.

Mr. Brennan: If I understand him, and the circulation does not commence until after the water is all heated, until it makes the passage way between the upper pipe and the return pipe; in other words, the same as if with a steam heating apparatus you go around and shut all the radiators off, get the steam up in the boiler, and then open up the radiators, letting the steam pass through. Then you get very rapid action.

Secretary Mackay: I have noticed in hot water apparatus, in cooling down, if one line were connected to an expansion tank, and the other line bottled up, as it were, that the circulation would continue longer in the line that was bottled up than in the line to the expansion tank where the vacuum condition did not exist.

It is not a new thing, because in 1880, I think, Baldwin, in his book on Steam Heating, illustrates a radiator set on the floor above the boiler, in a steam heating apparatus connected to the low water line, and that has been described as going on circulating long after there was any steam in the boiler, long after there was any pressure on the boiler. When there was a vacuum in the boiler the hot water radiators, some five or six feet above the boiler, continued to circulate on the vacuum. The water was held in suspense in the radiators and could not return to the boiler on account of the valve being closed. It has been known for years, though not in the way Mr. Hoyt has done it. This arrangement Mr. Baldwin described accomplished exactly the same thing, only he had steam instead of hot water.

Mr. Munroe: There is only one thing I left unsaid. I cannot see where any saving in fuel would be attained, because if he does not give up a certain amount of heat from the boiler he does not have that heat to give off when he comes to the greenhouse. In each case he would have to inject so much heat into the boiler. He can only give out as much as he puts into the boiler.

Secretary Mackay: The saving would be in allowing it to run longer at a low temperature when you did not require a higher temperature. That is the advantage of hot water heating, that you can heat to a low temperature when you only require a low temperature, and do not wish to maintain the intense heat of steam.

Mr. Smith: You cannot get out of the radiator any more heat than you put into the boiler, but it is possible you might get out considerably less if you were working at a disadvantage and had friction.

Mr. Stockwell: If there are any members of the society who are interested in this and live near Cleveland, would it not be well for them to examine this plant and make a report at the next meeting?

Mr. Smith: It is also near Pittsburg, where we have several members.

President Harvey: It will not be much trouble for some of our members to examine the plant and report on it in January.

TOPIC NO. 3

"How and to what extent, if at all, can the effect of humidity upon the sensible temperature of a room be modified by ordinary heating and ventilating apparatus?"

Mr. Chew: I conducted an experiment in my own house, heated with a hot air furnace; sitting in the evening reading I felt chilly, the result of the natural moisture of the body being evaporated more freely than it should, because of the excessive dryness in the air. The thermometer was up to 83 or 84, and the temperature was high enough; but there was some-

thing wrong. I set a tin pan on a floor register and hung a towel so that it ran down into the water and acted like a wick in a lamp. As the hot air came through the register it absorbed the moisture from the towel, and the room was more comfortable. In one case I felt cold with the thermometer above eighty. Under the other conditions I felt comfortable with the thermometer down around seventy. I believe that in the winter many houses are not as comfortable or as healthy as they would be if the atmosphere had a greater percentage of humidity.

Mr. Smith: I should gather that most of what Mr. Chew has said is assumed in he question, because it says, "the sensible temperature," which suggests precisely the difference between a moist and a dry temperature. The question seems to be more particularly directed to a discussion as to how that can be accomplished by ordinary and simple methods instead of by an elaborate humidifier and thermostat contrivance. Those of course are desirable and are used in institutions where the health of the inmates seems of enough importance, or where a manufacturer has to maintain a constant moisture for cigars, for instance. But for ordinary residences the thing is just as desirable. Cannot something of that kind be accomplished by means less primitive than Mr. Chew's wet towel, and a little less expensive than the humidifier?

Mr. Macon, Brooklyn: As a guest, I would like to ask if some of the members have not read perhaps more carefully than they had the time at the last meeting, Professor Carpenter's paper, in which he gave results of experiments that were made in Nebraska. The impression I got from those experiments was that while there was a difference in the humidity in the house of this weather observer where he employed a moisture apparatus, as compared with a house exactly similar, the difference was not very great. Moreover, the amount of water was very large. The impression I got was that there was not as much advantage from putting moisture into a house as you would imagine you ought to get, theoretically.

Mr. R. Collamore, Detroit (a guest): You might be interested in a trial of humidity made in a school in this city. They decided to install a system to control the humidity of different schools, as an experiment. The fan in the school building is of the double discharge type, and a humidifier was placed in each discharge of the fan. We found by experiment that a humidity of 40 was the most desirable. We were under the impression that a humidity of 50 to 60 would be more desirable, but when we had that humidity we found moisture precipitated upon the windows and the blackboards, and therefore we reduced the humidity until we found the point where it would not be precipitated. When the humidity was as high as 50, we also found that the atmosphere of the rooms had a depressing influence upon the pupils, similar to what we experience from what we call a "heavy day" in the summer. But when the humidity was reduced to 40, we found the results very good. I cannot give you as yet the effect of the humidity upon the pupils, although we expect to find that out during the coming year. The main point I had in mind was that the best point at which to maintain the humidity seemed to be 40.

One other difficulty that we experienced with this apparatus was that we could not get a uniform humidity in all the rooms, due, no doubt, to the fact that we had only one humidifier for six or eight rooms. It seemed to show that in order to maintain a uniform humidity in all the rooms it would be necessary to have a humidifier in each individual flue.

We started to use a water pan with the steam coils, and found that we were unable to get enough water by that method, due no doubt to the fact that our pans were not large enough, so we used steam jets and regulated the pressure until we found the point that gave the best results.

Mr. Macon: I would like to ask if you found any unpleasant odor from the steam you injected?

Mr. Collamore: No; the only way I think you would get objectionable odors would be where the water was contaminated with oil.

Mr. Munroe: The question reads: "How can this be attained by ordinary heating and ventilating apparatus?" It is a widespread idea among people who are not acquainted with steam heating, hot water heating and stove heating, that you get more moisture from hot water than from steam, and more from steam than from a stove. That is erroneous.

Mr. Capron: I had occasion last winter to install a hot water plant, where we had a tempering room, and indirect hot water on the first floor—mostly throughout. The owner had previously lived in a steam heated residence—indirect steam—and he told me one morning that he noticed that the flowers in the room lasted from ten to twelve hours, sometimes two days, longer than they did in his old house, and he asked me why it was. I explained to him the system that we had in there, and I really believe it was on account of the water indirect system, and that the air was not so dry as it was in the steam plant.

The President: Were there any leaks in the water pipe?

Mr. Capron: The system was absolutely tight.

Mr. Smith: I would like to ask, if no water gets out of the hot water system, how does it impart any moisture to the air?

Mr. Capron: I don't think there is more moisture in the air, but we do not heat the

air to the temperature that steam heating does.

Mr. Smith: There is no more moisture in the air, but there is simply a lower temperature, and the air has less absorbing capacity.

Mr. Capron: A little more temperate air; more even.

Secretary Mackay: There is a certain amount of humidity in the air. Air heated by steam at one pound pressure will extract a certain amount; air heated by water at a much lower temperature will not extract as much; when you want to dry lumber you put up fifty pounds pressure or more. The only apparent humidity of hot water heat is that it does not extract so much moisture from the air as a steam plant at a higher temperature would. In heating greenhouses they put evaporating pans right on the pipes so that they will pass off that moisture into the air. In some of our office buildings I have known people to set a half-inch water pan on top of the radiator and they claimed that they got the same agreeable temperature that they did from the natural air.

Mr. C. G. Folsom: I would like to ask if any member knows of any calculation being made as to the amount of humidity in a place, whether heated by steam or hot water, and if it has even been tested by a hygrometer or any instrument.

Mr. Blackmore: The question of moisture in a house is governed very largely by the method of heating and by the outside temperature. It is well known that as the temperature goes down the moisture is precipitated. At zero the air will contain a great deal less moisture than it will at 70; hence if we are heating by the circulation of the air only, as in the case of hot air, you are taking in large volumes of air, say when the thermometer is at zero, and you raise it up very often as high as 200 degrees. Now, there is an immediate thirst for moisture by that highly heated air that has been brought from the outside. That moisture must be supplied. If it comes up in the room it will take it from the furniture, if there is any moisture in it, and it will take it from our persons. The moment evaporation takes place from our persons we feel a sense of cold, and it is desirable to supply that moisture to prevent it being taken from the body of the person in the room. Now, any difference in the moisture of a room heated by steam and one heated by water is due to the fact that in a steam heated room the zone of circulation around the radiators is at a higher temperature than the average person in the room, therefore, there is a tendency for moisture to be drawn to supply the lack in this highly heated air. Around the hot water heater the temperature would not be so great, consequently the draft of moisture not so great.

Now, Mr. Chew made the point that a direct heated room was not supplied with sufficient moisture. The fact that so many buildings are heated in that manner is some evidence that they are not unhealthy. In your hot air system, where you heat entirely by air, the moisture must be supplied from the outside. In the case of a direct heated room, by direct radiation, the change of air is not so great, and as the change is not great the call for moisture is not great. If a number of persons are occupying that room, then the conditions are changed entirely, because each one is giving off moisture with his breath all the time; but in an ordinary house occupied by one or two persons, that condition is not noticed so we are not to assume that a room heated by direct radiation is at all unhealthy, or that the air is at all uncomfortable.

The convention then adjourned until two o'clock p. m.

FRIDAY AFTERNOON SESSION

The meeting was called to order by President Harvey at two-thirty p. m.

The following paper was read:

The Education of Heating and Ventilating Engineers

By Jas. D. Hoffman

Historical—Before entering upon a discussion of the subject proper a few words may not be amiss concerning the past and present conditions which have to a certain degree influenced the branch of engineering known as Heating and Ventilating Engineering. From a careful comparison of the standing of this branch of engineering with that of other branches, one is struck with the fact that the former has been completely outclassed in the process of development. It would be difficult to assign any one cause for this. It is probably due to the aggregate of a number of causes. The fact that there has been small demand for men trained specially in this branch shows that the general public has been only moderately interested, since in all lines of work it is evident that the demand largely controls the supply. A demand is made for certain materials by the public and the supply is forthcoming. In railroad competition, rapid transit, which is so necessary to the public, is met with improved rolling stock and road bed. In manufacturing lines quick and cheap production requires and obtains improved automatic machinery. In agricultural pursuits demands are made for labor-saving machinery constructed with the highest type of mechanical skill. In that part of engineering, however, which relates to the furnishing of buildings with the best of heating and ventilating apparatus the demand has been very slow in coming, and consequently the development of this work has been very slow.

In years past and not very far past eith-

er, a building was supposed to be satisfactorily heated if it had the regulation number of stoves and fire-places, and ventilation was considered sufficient through the opening of doors and windows. With improvements in all other lines of engineering moving at a terrific rate it is strange that this one branch has been sadly neglected; the tendency in the last few years, however, has been toward improvement, and in the near future we will see it taking on an unusual growth.

Several reasons can be assigned for the apparent satisfaction that the people have with the old methods of heating. Among them are the following: First, the heavy first cost of improved systems requires an outlay of money at the start that most people are not willing to incur; second, a willingness to heat only a portion of the house while the remainder is closed off during extremely cold weather renders a complete heating system unnecessary; third, the style of architecture used in most of the towns and villages is not sufficiently elaborate to justify the expense of a heating plant; fourth, in the parts of the country that are blessed with natural gas the gas heater is so light, convenient and efficient that no other system of heat was thought of than that of the direct heat from a gas heater.

The first and second reasons, of course, come from a very laudable ambition toward economy and will always prove the ruling factors; the third reason is being removed as new and more modern buildings take the place of the old, and the fourth applies to the gas belt only, where the failing supply of the gas tells plainly that other methods of heating must soon be adopted. In certain localities natural gas is already a thing of the past; where this is so the people who have been accustomed to the luxury of gas heating for a number of years are not willing to go back to the wood stove, but look for some improved method. This tendency toward providing more uniform heat and more economical systems than that of the stove is not confined to the gas belt alone, but is increasing rapidly in all sections. As a natural result in the evolution from the conditions named above there is springing up a demand for men who are specially fitted for the designing and installation of heating and ventilating apparatus.

METHODS OF TRAINING FOR HEATING AND VENTILATING ENGINEERS

The question then presents itself, how and where can this training best be given?

There appear to be three avenues open to such training: First, self-development without the direct oversight of an experienced engineer. In this case we assume the person to have a good practical knowledge of the art of plumbing with a reasonable degree of good judgment. As a result, since he must profit largely by his own experience, it takes the average man some time to distinguish cause from effect and his development is slow. Under such conditions designs must always be modeled after other existing designs, or else there is great danger of a defective plant. Second, a practical training received in an engineer's office under the guidance of skilled designers. This might be called the apprenticeship system in heating and ventilating engineering. Here he becomes experienced in the various processes, from the making of blueprints and tracings to the laying out, designing and installing of the heating system. Third, a technical training, such as is given by some of the technical schools of the country.

TECHNICAL TRAINING

Each of the above styled avenues of instruction, it must be assumed, has its advocates. It is not thought wise or expedient here to make comparisons; it is the desire of the author, however, to elaborate upon number three to the extent that a full course of instruction, such as might be adapted to any of the technical schools,* will be outlined. It is not the belief of the writer that what follows can, as it stands, fit all conditions, but rather that it will serve to bring out further ideas along this line and stimulate friendly criticism to the end that an engineering student in any technical institution who wishes to specialize along this line of engineering may have the best possible equipment when he leaves.

The chief objection to the technical graduate is that he is not practical. It is the object of this paper to outline a practical course in heating and ventilating which may, in a certain degree at least, remove the above criticism.

Preparation for the Course.—The subject of heating and ventilation should, if possible, be taken up during the last year of college work, when the student can have the benefit of a large part of the training in Heat, Thermodynamics, Machine Design and Steam Engines and Boilers, all of which subjects are fundamental in this work. The subjects of Heat and Thermodynamics fit him with facts and figures for analytical investigation concerning heat transference, while a knowledge of engines, boilers and general machinery gives him information of a more practical turn, the application of which is of great value to him in heating design.

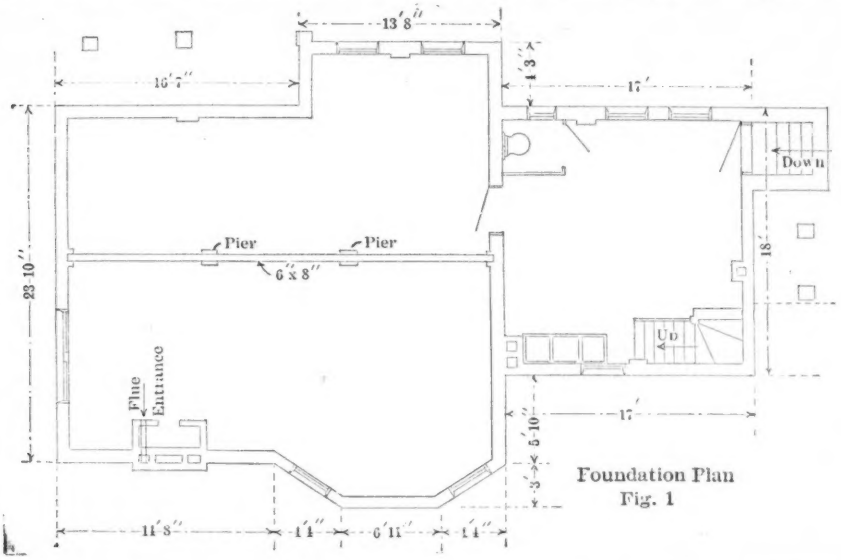
It may be assumed with a preparation as suggested, that a man is fairly well grounded in the fundamentals concerning heat transmission and that a course well qualified to fit him for active participation in heating affairs after leaving school should emphasize such points as will give him a knowledge of the materials of construction, such as pipes, fittings, and general

*The outline as presented covers the Course in "Heat and Ventilation" as given to the senior class at Purdue University, Lafayette, Ind.

plumbing. A course then fitted to his needs should not only require a calculation of heat losses, square feet of radiation, sizes of pipes, kinds of fittings, size of boiler, including grate, surface, etc., but it should require a complete layout of the entire system. This in a hot air system would include the location of the furnace; cold air duct and all leader pipes, risers and registers; while in a hot air or steam system it would include the location of the boiler and all pipe lines and radiators.

Scope of the Course.—The course should be administered part in the class room as lectures and recitations, and part (a set of designs) should be left to the student to work up largely upon his own responsibility, and submit the same for approval.

The work in the class room should be at least two hours per week and should be chiefly lectures with an occasional recitation. In the lectures very full references should be made to the various authorities



Foundation Plan
Fig. 1

on Heating and Ventilating with suggestions that these authorities be looked up. They should also include very full details concerning the laying out of such work, with suggestions concerning the proper selection of materials. The recitations should be made as practical as possible to serve in bringing out the points that would probably be confusing in developing the designs. All class room work should be timed to suit the design under consideration, otherwise the design work and the class room work will be independent rather than mutually helpful.

The work of design might very properly cover the following systems of heating:

(1) Furnace heating, as applied to residences. Time allowed, three weeks.

(2) Hot water heating, as applied to residences. Time allowed, three weeks.

(3) Steam heating, as applied to residences. Time allowed, three weeks.

(4) Blower system of warm air heating, as applied to schools and low office buildings. Time allowed, three weeks.

(5) Exhaust heating, as applied to high office buildings. Time allowed, two weeks.

(6) District heating from a Central Station. Time allowed, four weeks.

The above outlines will be found to cover the work very thoroughly and should be administered in such a way as to remove as much of the purely routine work as possible, otherwise the course which is planned for one-half year's work would be too long for the time allowed to the average student by the school curriculum. As an illustration: the student prepared for this work is fairly well quaified to make mechanical drawings and any relief which can be given him from his drawing work will permit the equivalent time being put to other and more important parts of the design. This relief can take the form of prepared building plans stamped off on standard sized paper, thus permitting him to insert his heating drawings on these same pages without the routine labor of reproducing an entirely new set of drawings.

In every design, say of a residence, the student should be presented with the three stamped plans, basement, first floor, and second floor (see samples, Figs. 1, 2, and 3), accompanied by a full and complete statement of the owner's wishes concerning the kind of plant desired. The student then considers himself in the position of a heating engineer who is retained to draw up plans and specifications for the said owner. In the development of the design certain points should be discussed in the class room, with all taking part. Sample specification sheets should be struck off covering the installation of typical systems and these will assist in guiding the designer in his work.

Beginning with design No. 1 the de-

signer's instructions should be given to him on separate sheets of standard size, the same to be submitted as a part of his finished design. These sheets may contain material about as follows:

Instruction Sheet F.
Hand in Sept. — '03.

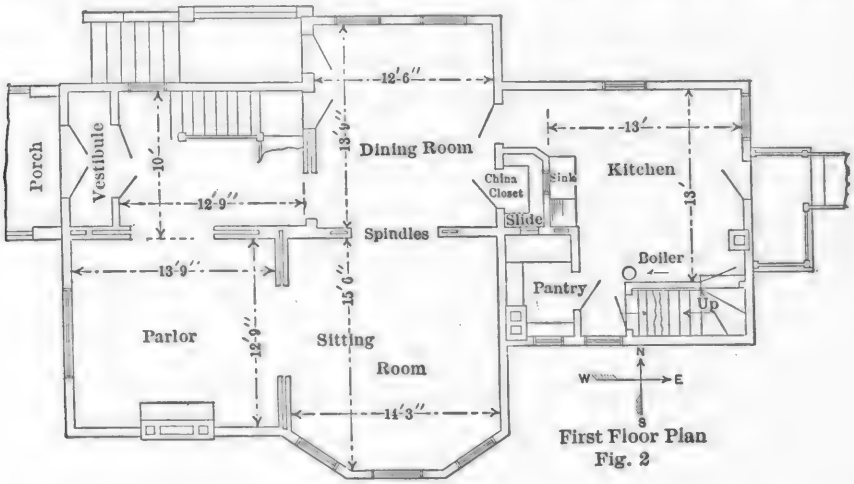
FURNACE HEATING PLANT FOR A TEN ROOM RESIDENCE.

This instruction sheet with the accompanying plans and sample specification will form the basis for the design for a furnace heating plant for the said building. Your attention is called to the following points for which you will fully specify:

Register: Net area, nominal size, elevation of wall registers and location of floor registers.

Riser ducts: Exposed or built in, covered or not covered.

Leader pipes: Direction, pitch and net area.



First Floor Plan
Fig. 2

Cold Air Pipe: Location, construction and net area.

Furnace: Location with reference to leader pipes, flue and firing; elevation; calculated grate area; make of furnace and catalogued grate area.

Foundation: Material and construction.

Accessories: All fittings and tools needed for complete furnace equipment.

NOTE.—On account of the reduced size of the building plans it is found advisable to specify here as follows:

Basement: 6 feet 6 inches ceiling.

Furnace room not ceiled or heated.

Laundry, ceiled and heated partially; three windows 3 feet by 2½ feet and one window 2½ by 2½ feet.

First floor: 10 foot ceiling.

Do not heat vestibule, china closet, or pantry. All windows 3 feet x 6 feet, except front hall, 2½ feet x 4 feet; parlor, 6 feet x 6 feet; sitting room, 4 feet x 6 feet; kitchen, 2½ feet x 4 feet.

Second floor: Ceiling, 9 feet.

Do not heat closets; all windows 3 feet x 5 feet, except alcove, 25 square feet; chamber, 35 square feet, and bath, 2½ feet x 4 feet.

Scale of plans, ½ inch=3 feet.

Instruction Sheet H.
Hand in Oct. — '03.

HOT WATER HEATING PLANT FOR A TEN ROOM RESIDENCE

This instruction sheet, with the accompanying plans and sample specification, will form the basis for the design of a hot water heating system for the said building. Your attention is called to the following points:

System: The system preferred is the low pressure, two-pipe direct radiation.

Radiators: Specify location, square feet of surface, style and height.

Piping: Lay out entire system of piping and specify size and pitch of mains and branches, size of risers, valves, fittings and connectios.

Expansion tank: Size, type and location.

Heater: Calculate grate area; select type and size of heater and specify catalogue grate area. It will be seen that heaters are rated, including mains and risers. Notice if the main and return tappings as catalogued agree with the computed sizes of the mains and returns.

Concerning the plans: All sizes of windows, height of ceiling, etc., may be taken the same as in the furnace design.

Instruction Sheet S.
Hand in Oct. — '03.

LOW PRESSURE STEAM HEATING PLANT FOR A TEN ROOM RESIDENCE

This instruction sheet with the accompanying plans and sample specification will form the basis for the design of a low pressure steam heating plant for the said building. Your attention is called to the following points:

System: The system will be the (one-pipe or two-pipe) plan with (basement or attic) mains.

Radiators: Specify location, square feet of surface, style and height.

Piping: Lay out entire system of piping and specify size and pitch of mains and branches, size of risers, valves, fittings and connections.

Boilers: Calculate grate area; select type and size of boiler and specify catalogued grate area. It will be seen that boilers as well as heaters are rated, including mains and risers. Notice if the tappings at the headers as catalogued agree with the calculated sizes of the mains.

Concerning the plans: All sizes of windows, height of ceilings, etc., may be taken the same as in the furnace design.

Instruction Sheet B.

Hand in Nov. — '03.

A PLENUM SYSTEM OF WARM AIR HEATING FOR A TYPICAL COLLEGE BUILDING

This instruction sheet in connection with the accompanying plans and sample specification will form the basis for the design of a Plenum system of warm air heating for the said building. A full and complete set of working plans and specifications are desired. In doing this valuable information can be obtained by inspecting the plants in buildings heated in this way. Your attention is called to the following points:

1. The entire building is to be heated to 70 degrees Fahr. in zero weather, having the velocity of the air not to exceed five feet per second at the register and the entering air at a temperature of 140 degrees Fahr.

2. Locate and give sizes of all ducts and registers both heat and vent.

3. Show on basement plans the runs of heat ducts with branches from the blower to the riser ducts.

4. Locate and specify as fully as possible for the installation of the blower system with its accompanying brick work and intake.

5. Give fully the amount of heating surface in linear feet of pipe, and specify the kind of heater to be used.

6. Such other details of construction as go to make the plant a complete working system.

Note: Since the basement is to be used by classes all main ducts must go below the basement floor. This will give a downward pitch to the main duct as it leaves the blower.

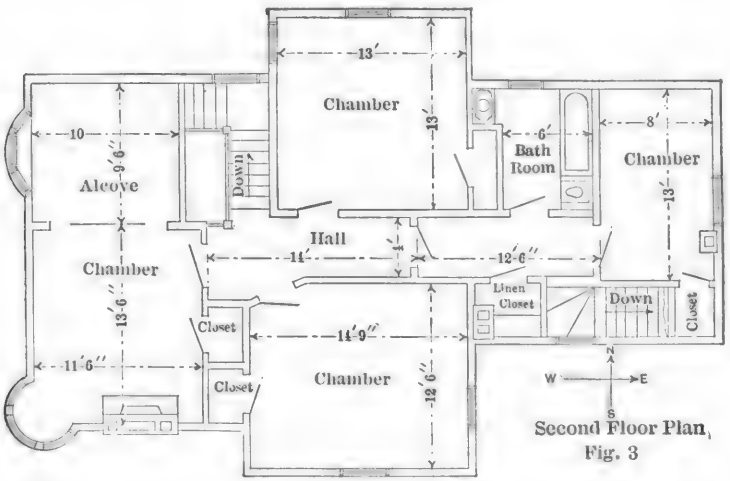
Instruction Sheet W.

Hand in Dec. — '03.

A DESIGN OF A ..... VACUUM HEATING SYSTEM FOR A FOURTEEN STORY OFFICE BUILDING

This instruction sheet together with the accompanying plans will form the basis upon which you will design a ..... Vacuum Heating System for the said building.

The following assumptions, all of which are reasonable, will be understood to form a part of the work.



Second Floor Plan,
Fig. 3

1. The building above the basement may be so planned as to give each floor practically the same layout, hence, the one floor plan is added to give a conception as to how the building is designed and where the riser pipes are located. This plan may be accepted as a part of the design without modification.

2. The building will have .... radiators, ... to each floor, including basement, so placed as to attach conveniently to the riser pipes as shown. The riser pipes will supply heating surface as follows: 1, 5, 8, 9 .... square feet each; 2, 3, 4, 6, 7, 10, 11, 12, ... square feet each.

3. About .... boiler H. P. will be needed, say three .... H. P. .... boilers for power and heat in such a plant and this should be planned for. Connect with a header pipe say .... inches diameter.

4. Three direct connected engines and

dynamos will be needed, having ...., ... and .... H. P., respectively. These engines will connect to an exhaust header which will form the reservoir, from which we lead the main steam heating pipe or pipes.

5. .... Vacuum pumps or exhausters and a .... heater will also be installed.

It is not to be understood that the full boiler H. P. or the full engine H. P. will be used all the time. This should be compiled out of smaller units so connected that any one or all may be used according to the demands.

6. Other necessary features of such a vacuum plant not mentioned here should be noted on the plans.

It is suggested that one or more sheets of details will be necessary since a plan only of such a system does not fully explain it.

The chief features of this design will be the arrangement of the apparatus in the basement showing the flexibility of the plant for heavy and light service and the convenience with which it may be handled for heating purposes.

Instruction Sheet C. 1.
Hand in Jan. — '04.

A CENTRALIZED SYSTEM OF HOT WATER HEATING FOR A RESIDENCE OR BUSINESS DISTRICT

This instruction sheet together with the plan of the city showing the portion of the city to be heated will form the basis upon which you will design a centralized two-pipe hot water* heating system for the said locality.

The plant is to be installed in connection with the Municipal Lighting and Pumping station of ..... The equipment of the present plant which will need to be considered in connection with your design may be assumed as follows:

Engines .... H. P. total,
Boilers, ... H. P. total,
Pumps on City Service, two .... gal. capacity each.

You are limited to a heating capacity of not more than .... square feet of radiation. The plan of the city is shown in Sheet C 2 with the business and principal residence district marked. From these districts you will assume the area needed to absorb the full amount of your capacity and draw up the plans and specification covering the street mains, typical house connections and power plant, giving especial attention to the latter.

No requirement will be made relative to the machinery now installed. This may be counted as a part of the final estimate and may be arranged as the designer wishes.

In this design you are requested to notice the following points:

1. Layout of street mains with sizes of pipes.
2. Details of construction of conduit.
3. Expansion and anchor arrangements in conduits.
4. Power house arrangement, engine, boilers, pumps, heaters, etc.

You are required to take the above material and from the lectures previously given work up and submit the complete design and calculations.

Order of Arrangement in Design: When a design is submitted for approval it should be compiled as follows:

(1) Correction Sheet, to be used only for instructor's recommendation.
(2) Statement of the design, with such data sheets as have been given out by the instructor.
(3) Sample specification sheets.
(4) Plans and elevations.
(5) Calculation sheets.

Inspection of Designs: Every design should be carefully inspected and returned to the designer with the instructor's recommendation. These recommendations should be very general and should cover all points of design. If the design is very defective it should be reconstructed and returned a second time for approval.

Conclusions: In this work as in every other line there are some difficulties to be met with in its execution. The tendency of the average student is towards strict observance of formulae, a state of affairs not in accordance with good heating and ventilating design, consequently the ability of the instructor is put to the test of harmonizing the purely theoretical with the practical in a way that it will appeal to the student. The cultivation of a good judgment and the ability to form estimates with necessary allowances are absoutely essential in any design of this kind. In some of the exact sciences the student may be told that his results are wrong or right as the case may be, but in the work under consideration a number of solutions may be offered for the same design, each of which would be called good, but not one of which would be called the best solution. The results then that must be expected from a class of such students will be decidedly varying in principle and imperfect in detail. During the progress of the work, however, these imperfections should gradually give way so that at the close of such a course each student will be able to give a fairly satisfactory account of himself.

The Secretary: Professor Carpenter expects to be here this afternoon, also Professor Kinealy. I suggest we do not finish the discussion this afternoon, but that it be laid over, as these gentlemen will be prepared to discuss the question if given an opportunity.

The President: The two gentlemen whom the secretary has mentioned are specially interested in that line of thought, and if there is no objection we will proceed to the discussion of the next topic.

*A single pipe hot water or steam system may be taken as well as the one given. The system chosen is probably as satisfactory in its solution as any.

TOPIC NO. 4

"Does the practice of consulting engineers, with respect to heating and ventilating matters, admit of uniformity in prices for services, and if so in what direction and to what extent?"

The Secretary: This topic was suggested by Mr. George Welsby Scott, a member of our society in Chicago, who is unable to be present and who has written a short paper on the subject to open the discussion, which I will now read.

Scale of Prices for Professional Services

In paragraph 8 of the charter of the American Society of Heating and Ventilating Engineers we may read that one of the objects for which the society was formed is the establishment of "a uniform scale of prices for all professional services."

Evidently those concerned with the preparation of the charter were duly impressed with the occasion for making the foregoing one of the aims of the society, and it may be assumed that they were prompted in this direction by their several experiences. As a matter of fact, few people are so situated that they need not be concerned with the question: "How much shall I charge for my services?" To the many this question is a constantly recurring one, and in its final significance it closely parallels the associated problem rarely ever absent from the mind of the manufacturer and merchant, namely: "How much shall I charge for my wares or goods?"

The occasion for this questioning, regardless of its particular form, is, of course, to be found in the fact that all matters of this kind are inseparable from a primary consideration of two parties; the one offering, or able to give, the desired service, and the other the party who is expected to pay for the service to be rendered. In a secondary degree is the matter of supply and demand in general.

In many of the beaten paths of service —whether manual or intellectual—the scale of charges is more or less arbitrarily fixed by local conditions and the action of combinations; but for so-called professional services the matter is not so definitely arranged. True, custom has set its approval upon certain charges for lawyers and doctors; but are we not all acquainted with various members of these learned professions who receive, at times, fees much larger than those commonly held as standard? And is it not a fact that a large number of them receive fees very much less?

To those who receive relatively small payment, or to those who feel that their services are worthy of higher compensation, the thought of standardizing on a larger basis would, no doubt, prove very attractive indeed. But to the more fortunate ones who, like their equally well favored fellows in law and medicine, are in receipt of relatively large compensation the matter may appear of much less moment.

At all events, the years of practice in law and medicine have not resulted in any marked degree of uniformity with respect to prices for services in either case; and is it likely that the members of this or of any other engineering society or profession can do better? Apparently those of this society who framed the charter deemed the matter well within the bounds of probability; and now, after well-nigh ten years of active association it would seem proper to determine the status of the eighth object of the society's reason for existing and inquire as to the likelihood of its fulfilment.

(1) The question may then be asked; Does the practice of consulting engineers with respect to heating and ventilating matters admit of uniformity in prices for services, and, if so, in what direction and to what extent?

(2) Shall the charge be based upon time and expenses? If so, what shall be the unit of charge?

(3) Similarly, if the charge is to be based upon a percentage of the final cost of the work, what shall be taken as the degree of percentage?

(4) What course shall be taken concerning cases involving much detail work and much expenditure for traveling and other expenses. This in comparison with less involved and less expensive charges.

(5) And in connection with the foregoing, what shall be said concerning locality; shall engineers in large cities like New York, Philadelphia and Chicago charge the same as, or more than, their fellows situated in smaller cities, towns or villages?

(6) And with respect to assistants: How shall the services of these be graded and charged for?

Mr. Blackmore: I think that there is no profession that requires the amount of talent, skill and energy that it requires to pursue this calling that is so poorly paid as this one, and I think it is a very laudable object for this society to do all they can to get proper recognition from the public, to the end that the public may appreciate the value of the heating and ventilating engineer, so that they may pay him adequate compensation for his work.

The contracting engineer as a rule is not properly paid. The amount of his profit is not fair compensation in a great many instances for the amount of labor and skill that he has to apply to his work.

Mr. Feldman: I do not think that any society can set a certain price, or a certain standard of fees. The consulting engineers of New York, so far as I know, are following the plan adopted by the architects, of charging so much per cent,

on the cost of the work. The average fee is five per cent.

Now, when an engineer has to get his work from an architect, even if he does get the full five per cent. he has to make something on the engineer.

Secretary Mackay: For a number of years our society had a committee that met in conjunction with the American Institute of Architects on this line of establishing a minimum price for services, and at the annual meeting of the American Institute of Architects two years ago at Buffalo, they decided that any expert service in heating or engineering or ventilating was to be paid for by the client in addition to architect's fees. I have somewhere their printed schedule, the charges for their services, which I believe is a minimum of five per cent. and as much over as special conditions warranted.

Mr. Brennan: In my experience, I have noticed a great many architects, in making plans and specifications for buildings, will then call on some heating and ventilating engineer to make heating and ventilating plans, and instead of his putting his name on the plans the architect puts his own name on. If you ask him why he does that he says, "Well, if I sav that you made them, those other fellows will knock you and tear them all to pieces." All the points are referred to this architect. He won't say who made the plan for him, because the other people will knock it.

I find that a great many men are circumscribed in that way. If they get a chance to make a set of plans they should charge for them, and put their name on them for each heating, ventilating or power plant of any kind.

TOPIC NO. 5

"Has the recent discussion of the Plenum System of heating in England added any new and useful information on this branch, or conclusively demonstrated any point."

Secretary Mackay: One of our members who is present suggested as an addition to that topic:

"For perfect ventilation how should the air be introduced and extracted, downward or upward?"

President Harvey: Some time earlier this year I received a copy of a paper written in England condemning the fan system. This is a report of the Select Committee on Ventilation of the House of Commons. I did not know until I received this that there was any question. In my own mind, there never was any possibility of getting an amount of fresh air into any large room without some mechanical means.

Mr. Feldmen: I have also received a copy of the same report, and it interested me very much; that is the reason why I sent in an additional topic for discussion in connection with it. I thought it would be justifiable to read a few extracts from this paper before the Society here, because some of the members probably have not read it, especially since some of the authorities quoted in that paper are well known, and if they have changed their minds in England it is proper for us American engineers to take note of it and discuss it. For instance, it says:

"A paper on 'Plenum' ventilation as applied to a hospital in Belfast was read a week or two ago before the Royal Institute of British Architects. In the course of the discussion, a distinguished medical scientist (Dr. Christopher Childs) said:

" 'In many "Plenum" installations he had inspected, there had seemed to him grave defects in the relative positions and sizes of the inlets and outlets, and it seemed to him that no definite principles had been laid down as to the most important details. He was not sure that it afforded fresh air for hospitals and schools. They all recognized the necessity for a full supply of pure air. It was easy to test the atmosphere and ascertain the relative proportion of carbonic acid gas in a volume of air, and also to count the microbes; but hitherto analysis had failed at one point—in showing them whence came the invigorating qualities which they all recognized as present in fresh air. These health-giving qualities seemed to him to be lacking in air pumped into a building under a "Plenum" system, and to be present in methods of natural ventilation. The value of fresh, not filtered or pumped air, was obvious in the treatment of cases of phthisis, and all recognized its exhilarating effects. . . . He would not allow that it (the "Plenum" system) was the best for hospitals, as patients needed the stimulus of absolutely fresh and frequently changed air.' "

Then another extract from an American authority, Professor Woodbridge. All of you know that Professor Woodbridge has been commissioned to examine the ventilation of the capitol at Washington, and this extract is from his report:

One would have though that in these days of higher education and sanitary progress, even a school boy would know that, as Professor Woodbridge so lucidly explains it:

"The carbonic acid gas yielded by respiration from the lungs and transpiration through the skin is as thoroughly diffused in the warm air currents rising from the body as is the same gas made by the candle or gas flame in the air currents ascending from those flames. That gas when once diffused in air, can, because heavier than air, no more settle down out of the air, and occupy the lower stratum of a room, than the salt, because heavier than water, can settle out of the sea to its bottom."

* * * * * *

"The air in contact with the body or clothing, or expelled from the lungs, made moist and warm by the body's heat and vapor, rises in a current which has a far more rapid rate of upward movement than any descending rate which can possibly be given to the mass of air ventilating a hall."

Now, all of you know the American method of ventilating is downward. The fresh air is let in about eight feet above the floor and taken out in the opposite wall near the floor. The English engineers practice and advocate the upward or natural method of ventilation and Professor Woodbridge seems to believe in that method. He says further:

"In downward ventilation the air breathed by floor or gallery occupants must, therefore, be that of the ascending currents of vitiated air reversed by and diluted in the ascending mass of air used in the downward movement. In well-planned upward ventilation the individual currents rise to the ceiling and there escape, leaving the floor occupant in the cooler and purer

air supplied at the floor, and untainted by the vitiated air which rises out of and away from it. . . . The effectiveness of properly arranged upward ventilation of audience halls is demonstrated in the most recent work of this kind in two theaters and a music hall in Boston."

Now, one thing that particularly interested me is a reference made to Mr. David Grove, supposed to be an American engineer, who settled in Germany, and who has designed the heating and ventilating for the Parliament Building in Berlin, and for many other large public buildings in Germany, and who has published a book embracing his work. He says:

"The failure of the 'Plenum' downward system at the German House of Parliament, Berlin, and the substitution of upward or natural ventilation, and the following extracts from the report of the eminent American engineer, Mr. David Grove, who carried out the work, are very instructive. After two years' experience with both methods, the engineer reports, under date of January 3, 1898, as follows (addressed to K. Hinckeldeyn, Imperial Director of Public Buildings, Berlin):

" 'In reply to your inquiry of December 25 last, I have pleasure in informing you that the practical working of the heating and ventilating in the new German House of Parliament is such as I felt sure would be the case when preparing the plans. The experience gained during the forty years of practical attention which I have given to the subjects of heatng and ventilation has proved to me that no system is so good as the up-draught system, this being a natural one, and, if properly arranged, in every way effective. When I planned the heating and ventilating of the building in question it was stated in the program that down-draught ventilating must be employed, and that is the reason why I planned that system. At the same time, however, I prepared plans for a system which I felt convinced would be far superior, namely, for upward draft, and the practical working of this principle is in every way satisfactory.

" 'When experiments have been made with down-draught, the air in the room has been found to be very oppressive, especially in muggy weather.

" '. . . It has for a long time been a fully settled matter in my mind that the only way to really ventilate a room is to let the air take its natural course. During the whole of my experience I have never yet seen a room in which the down-draught system is used where the ventilation has been a perfect one; and, of course, in any rooms where gas is burned, such a system is entirely out of the question.' "

A still more interesting point is the following, which was stated by a member of that Select Committee:

"As a significant instance of the change that is taking place in ideas regarding the respective merits of artificial and natural methods of ventilation, the results of the new Odessa Hospital competition are distictly instructive, this hospital being one of the largest in Russia, if not in the world.

"As the efficient ventilation of the hospital was considered to be of the first importance, very special attention was given to the subject, the leading ventilating engineers in Europe being invited to submit plans. There were, it is stated, thirty-four schemes in all sent in, nineteen of which were from this country, four being American systems. All were mechanical with the exception of one, which was a natural system. The decision arrived at in respect to these plans was that a mechanical system should be adopted. It was resolved, however, that before selecting any particular plan from among the number submitted, a committee should be appointed, consisting of engineers, and architects and others qualified to judge, to investigate into the merits of the respective systems, as applied to buildings in different countries. This committee commenced its labors in Odessa, where several public buildings are mechanically ventilated. It seems that in none of the buildings inspected was the mechanical system found to be in operation, though of the latest construction, the committee being informed in each case that the ventilation was better and less objectionable without it, and it had therefore been disused. The committee paid a visit to this country and made exhaustive investigations into the different systems in use here, including the natural system. Upon the completion of their investigations, the report of the committee was laid before the Municipality of Odessa, who had also received reports from other quarters, the result being that it was unanimously resolved that mechanical ventilation should not be employed, and that the natural system (Boyle) be adopted.

"This certainly speaks volumes as to which of these systems, the natural or the mechanical, was found to be the best when the test of actual experience was applied to them by competent and unprejudiced judges."

Here is another extract:

Mr. Addison Hutton, architect, in a lecture on the plans of hospitals recently delivered, before the architectural department of the University of Pennsylvania, made a most significant statement as the result of his investigations throughout the states that with respect to ventilation one point worth noting in regard to this was: Doctors, for a wonder, do not differ in their recommendations for top ventilation, and what is termed ridge or natural ventilation.

I think that is interesting, because there must be something in it, anyhow, and let us discuss it.

Mr. Smith: I have here a later document received from England, bearing on this same subject. It is made up of a lot of extracts from the report of a debate of the Royal Institute of British Architects at London, on June 6. It is sent by our member, Mr. Nesbitt, who says in regard to it:

"It will be found in the foregoing report that a friend of natural ventilation repudiated certain means that had been adopted to advocate that system and to advertise a particular firm."

He referred to a publication issued in imitation of a Blue Book report, which is what Mr. Feldman has been reading from, but his description of it was erroneous, in that it is not official.

"The book was issued in such a way as to cause the casual reader to believe that he was perusing a report of the select committee of the House of Commons; but the matter of which it was made up consisted chiefly of the alleged opinions of persons who were not called before that committee, and the conclusions set forth were opposite to those at which the committee arrived. It concealed its description in the body of the letter press where only a careful reader would find it."

Now, these are some of the quotations here that bear directly on this subject:

"Mr. Pick, after expressing his high appreciation of the general arrangement of the Belfast Hospital which he had visited said: 'In hospitals the superficial area and cubic feet of space required to attend properly each patient are necessarily very large, and therefore the requisite changes of air are less difficult to obtain than in such buildings as assembly halls, workshops, schools, out patients' departments and similar places where a large number of people are closely packed together. For these latter buildings I am perfectly convinced that up to the present time no system gives such satisfactory results as a properly designed Plenum system, especially so when some mechanical means are arranged for creating a positive extraction of the vitiated air.' "

* * * * * *

"I think it is not only desirable in such buildings, but almost essential."

"Mr. A. Saxon Snell, after a few opening remarks, said: 'It was a somewhat unfortunate thing that the question of Plenum ventilation had been canvassed so much in the press by one or two firms commercially interested in the matter. No doubt others like himself had been confronted by their clients with a little blue book purporting to be a report of the House of Commons Committee on Ventilation. A little reading of that book would show that it is nothing more than a string of quotations put together, including some remarks of his own, to show that the Plenum system of ventilation was a mistake. There was really no need to study such a book, because so many excellent papers had been read upon the subject during the last few years, notably by the Sanitary Institute and the Institute of Civil Engineers and others.' "

"Mr. Harold Griffiths dealt with the charge of the monotony of the air supply, and pointed out that the temperature could be varied under the Plenum system to any degree in the winter, or whenever warmth was required."

That shows the latest we have from the other side.

Mr. Blackmore: It seems to me this is a very partisan paper, and I read it to see if there are any real reasons why the Plenum system was not as efficient as it ought to be over there. While it is a good paper to bring the matter to our attention in this country, it shows more than anything else that the condition of the art in England is very far behind. Their lack of comprehension of the system is causing the trouble that they have had. I cannot see why, when you are heating a room with warm air and you are taking out comparatively cool air, you should try and reverse the order of nature and put the cool air out at the top and bring the warm air in at the bottom. I dare say you would mix the air more, which is what he seems to think we ought to do, but I doubt whether you would get it as pure, and the object in this country has always been to bring in pure air and take out foul air.

Mr. Feldman: I only read those extracts which dealt with the advocating of the movement of the air upward and I would like to hear the opinions of the members of the Society. Suppose we wanted to introduce the air for ventilation only —heating to be done by direct radiation and have the air enter the room at 70 degrees, now the question is, would it be better to bring it in as we do in this country under the ceiling or as they recommend in England, near the floor. Mr. Grove does not condemn the Plenum system, he merely arrived at the conclusion of reversing the order of the letting in fresh air and abstracting the foul and believes now in the upward ventilation.

The President: I inferred that he thought that the natural current in a room was better than forced or mechanical draft. The impression that I got from reading the paper was that he was opposed almost entirely to using the fan system.

I have seen in the municipal building in the city of Glasgow, a plant that was put in about eight or nine years ago, and had only been used for one winter when I saw it, and it was certainly a very fine piece of work. All of the air that was brought into the building was drawn through sheets, with a supply of water thrown on to the sheets. Different tests were made, and the air analyzed in the different buildings, quantity of air taken into each room analyzed, etc., and I really thought when I saw that that it was right up to date. I did not think we had anything in the states that was ahead of it. So when I received this paper, I thought it was an entirely new tack.

Mr. Brennan: About ten years ago in Milwaukee there was an asylum for the insane, possibly two thousand patients there; the building was heated by indirect radiators, partially for ventilation, and by direct radiators. They had upward ventilation. The smell was very nauseating in almost every room. They decided to change and put in the Plenum system for ventilating purposes only. They put in two fans for three buildings, and had one fan at each end. There were three buildings in a row, and they had it arranged so that if one fan should break down, they could use the other temporarily for the other two buildings. Since putting that in you could go to any room and notice the difference, just by walking through the room; it was better and purer in every way.

Milwaukee has all its schools warmed by direct radiators and ventilated by fans run by gas engines or motors, and they can change the air in the class rooms at the rate of fifty cubic feet per scholar per minute, and in the halls and corridors and toilet rooms every ten minutes, and you can notice the difference immediately by just walking through the rooms; the air is pure and fresh.

President Harvey: The best argument I know of for ventilating by the blower system is New York city. There are now fifty-four schools in process of construction, and there were twelve more contracted to be let in July.

The State of New York has recently passed a law making it compulsory for every school building to have a certain amount of air delivered per minute for each occupant. That is the first state where a compulsory law has been passed.

Mr. Feldman: In addition to the public schools in New York, I think to convert those people to the Plenum system it would only be necessary to take them down to the new Stock Exchange Building where they would find perfect ventilation accomplished by means of the Plenum system, air admitted from the top.

There is also installed and in operation a refrigerating plant for cooling the air in the summer. The windows are always kept shut. By means of regulation, the temperature is kept at 70 degrees all the year round, winter and summer, and, notwithstanding the large number of people on the main floor the air is always fresh and pleasant.

TOPIC NO. 6

"Do the increased benefits of fan over gravity systems offset the operative necessities?"

Mr. Chew: I feel that it is only lack of knowledge how to apply fans that prevents their wider use, and I am satisfied that some of the men here who are interested in the fan side, could give, without very much trouble, information that would be very useful.

The operative necessities are of secondary importance. Where can you use a fan? If somebody can give information as to where fans can be used and why they can be used I think it will be beneficial to our members who do not use fans in their work, who might use fans more with benefit to themselves and to their customers.

Mr. Brennan: There have been several fan systems in the west, and when they got twenty degrees below zero, which they hadn't counted on, they started up the fan a little faster, and instead of heating the building, they simply pumped in more air and colder air, consequently they put in a couple of direct radiators.

Now a fan is all right for ventilating purposes, and in some cases it is all right to heat large foundries and places where they can use the air over and over again, where they exhaust enough to offset the nauseating air that is made in the building.

The President: I understood from Mr. Snyder of New York, that they made a practice in the schools of using a fan for bringing in the quantity of air required for ventilation, and depended upon direct radiation for the heat.

Mr. Feldman: You are right.

Mr. Munroe: The hot blast system was decided upon for the Baltimore schools and the concern I was with got the contracts for seven schools. It fell to my lot to design the apparatus. Specifications were gotten out by the building inspector, but they just said that the fan should be used—high pressure steam coils with tempering coils. That was sufficient to design a heating apparatus from.

They worked successfully, with an intelligent engineer to operate them, but after we turned the plant over to the city engineer, there came complaints. He employed our firm to put an engineer on the job and operate them for a week, and the results were exceedingly gratifying. Every room was regulated with two degrees, without any temperature regulation; just hand regulation. The fans were operated at the proper number of revolutions to give sufficient air to fill every room in the building four times an hour.

The trouble had been from laziness. The engineers did not want to keep the steam pressure up, and ran the engines with forty pounds of steam, so that the revolutions of the fan dropped below the normal, and certain rooms in the building would get air and others would not. There was a suction out of some of the rooms. That was immediately overcome by running the fan to the proper number of revolutions to deliver the air as figured on to every room in the building.

It is all indirect radiation. The hot air registers were in every case located side by side with the outlet registers, and the circulation would be through the room; while sometimes it was a pretty strong current of air, it was not objectionable, because the hot air was overhead, and if there was a draft across the floor it was about 70 degrees.

You can't use too many fans in ventilating large buildings. The Belvidere Hotel has just been completed in Baltimore, and it has in it eight ventilating fans. There are no heating fans there. The building is heated by direct and by indirect radiation, but there are eight ventilating fans. Where those fans are used properly, better results cannot be obtained than by a large number of ventilating fans.

The convention then adjourned until ten o'clock A. M., July 16.

SATURDAY MORNING SESSION

President Harvey called the meeting to order at 10 A. M.

Mr. A. O. Jones of Battle Creek, Mich., read the following paper:

Advanced Methods of Warm Air Heating

By A. O. Jones, Battle Creek, Mich.
(By Request)

In consideration of the fact that a great many furnace dealers oppose a plan of warm air heating where two rooms are to be heated from one supply pipe, and knowing from experience that the same is practical, the writer has been prompted to describe a system, and attach herewith a plan of a residence which has been heated for the past three winters with a warm air furnace, where seven basement or supply pipes are used for heating thirteen rooms. These supply pipes have a larger area than would be necessary were they intended for heating but one room, and instead of conveying the necessary amount of warm air for heating each room through a separate pipe, the amount necessary for two rooms is conveyed through one large pipe which has an area equal to the areas of the two pipes necessary to do the work separately.

While a prejudice has existed, and may exist at the present time, in the minds of a great many furnace dealers or warm air heating experts against a plan of heating two rooms from one supply pipe, it is, no doubt, owing to the fact that they have never given this system a trial, or because they have attempted to heat two rooms on the same floor by branching from the main supply pipe and attempting to carry the air in another direction, which would necessitate an angle, or pos-

sibly an elbow, to change the course of the air from the course it was traveling in the main supply pipe, where it is next to impossible to successfully heat two rooms with one pipe. The system herein described, however, is on an entirely different plan. Wherever it has been tried it has proved a success, and is admitted to be along advanced lines. It may be in order to mention that during the past three years several thousand warm air furnace dealers have tried this system and have found it thoroughly practical.

By referring to the plans presented herewith, it will be seen that in the residence referred to, which is owned by T. Evans, of Battle Creek, Mich., there are six rooms and a hall on the first floor and six rooms on the second floor, which have a total area of 23,548 cubic feet. It will also be noticed that there are 504 square feet of glass surface and 2,267 square feet of exposed wall surface, equivalent to 236 square feet of glass surface; in all, the equivalent of 740 square feet of glass surface.

In estimating the amount of warm air necessary for heating a given room, a plan, which has been followed successfully during 20-odd years of experience in the furnace business—is to reduce the exposed wall surface to glass surface, and divide the exposed wall surface by the thickness of the wall—in no case less than 10—and this added to the actual glass surface, which, when multiplied by 75 and added to the cubic contents and multiplied by .013, gives the area in square inches necessary for heating a given room to 70 degrees F. when the outside temperature is at zero. One per cent. should be added for each degree below zero. This rule applies for warm air pipes for heating rooms

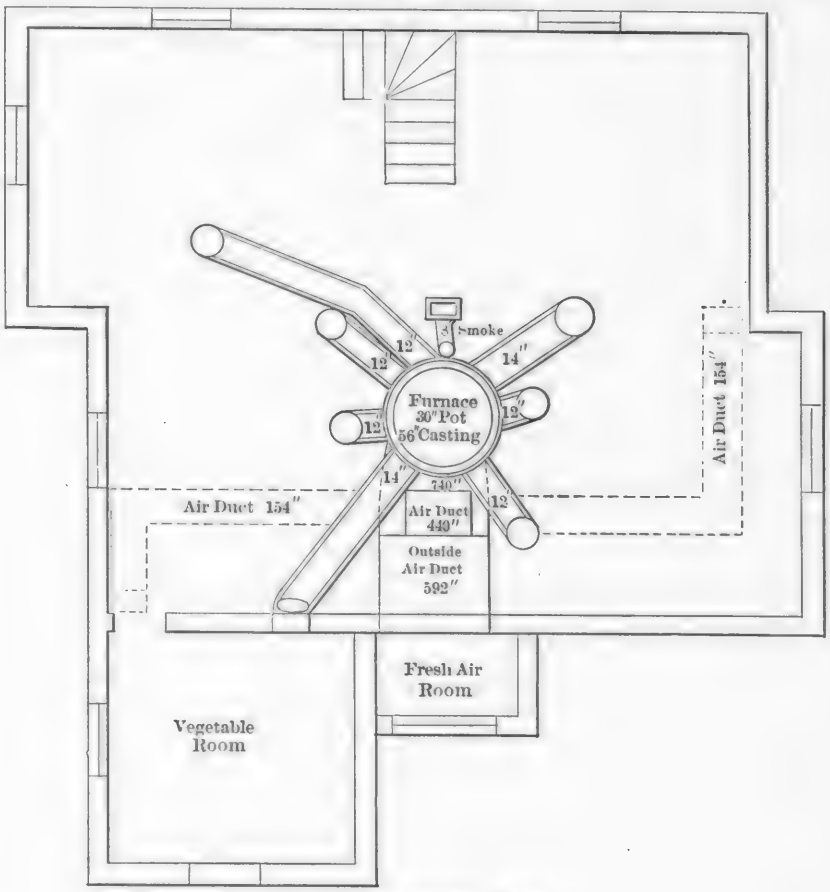


FIG. 1—BASEMENT PLAN

on the first floor, where the velocity of the air in the basement pipes is 100 feet per minute, when the pipe has an elevation of 1 inch in 12; but inasmuch as the velocity increases when the elevation of the pipe is increased, and as the velocity of the air in the wall pipes leading to the second floor is 300 feet per minute, they can be much smaller; and, in this case, the wall pipe which conveys the warm air to the second floor rooms has an area of 40 per cent. of the necessary area for heating rooms of the same size and exposure on the first floor.

By referring to the plan of this resi-

dence it will be seen that the registers are placed in the wall; and, in order to secure sufficient opening through the bottom of the register boxes, where they connect with the basement pipe, especially constructed side wall registers have been used, which are so constructed that they have an opening sufficiently large to take care of all of the air that the basement pipe can supply.

In the rooms on the first floor, where more than 78 square inches are necessary, and where the room above is also heated

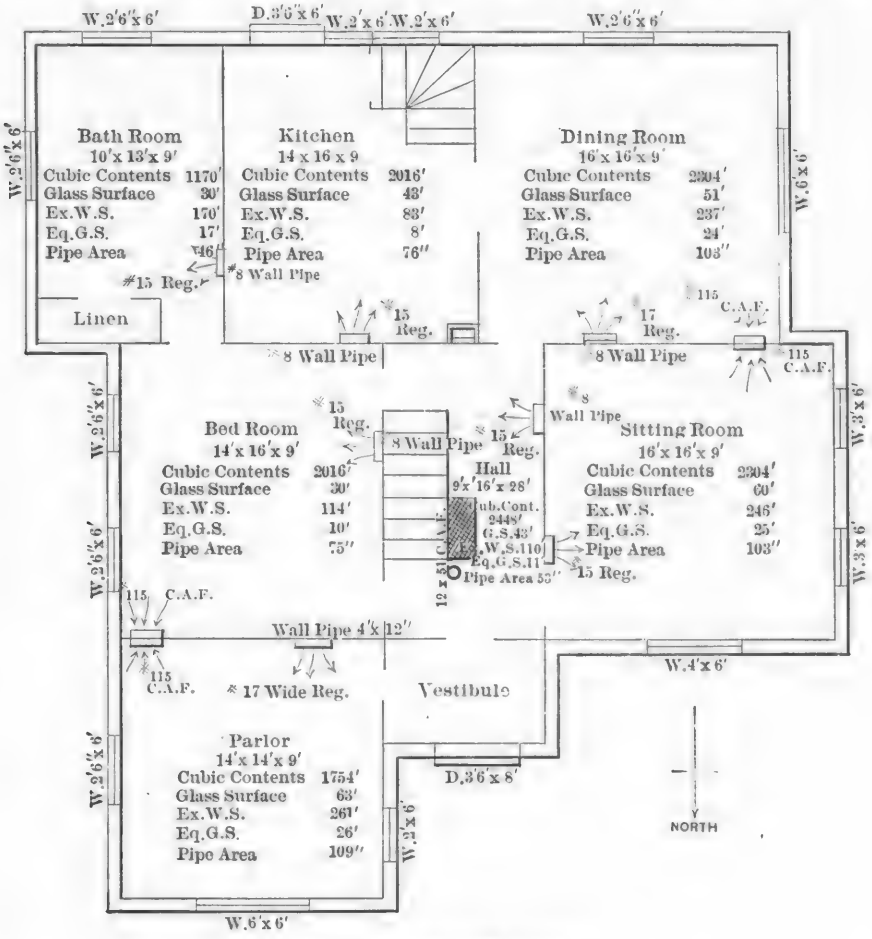


FIG. 2—FIRST FLOOR PLAN

from the same supply pipe, a No. 17 register has been placed, the bottom opening of which has an area of 113 square inches. This is connected to the furnace with a 14-inch pipe, which has 154 square inches area. The question, no doubt, will arise: How can 154 square inches pass through the bottom of this register, which has but 113 square inches opening? By way of explanation, I will say that in the basement pipe of 154 square inches, where the velocity is 100 feet per minute, 117 cubic feet of air will be discharged per minute; but the velocity of the air increases when the elevation is increased, and as the elevation in this case is increased at the first turn of the elbow, it is estimated that this air is traveling at the velocity of 150 feet per minute when it is passing through the bottom of these register boxes. It will be seen that 79 cubic feet of air will pass through this opening at a velocity of 100 feet per minute, and 118 cubic feet at a velocity of 150 feet per minute, or more than a 14-inch pipe will supply. In rooms on the first floor, where less than 78 square inches are necessary, a No. 15 register is used; and as all of the rooms in this residence have been heated from 70 to 75 degrees F. during the coldest weather since this plant has been installed, some three years ago, it will be seen that the above estimates are correct.

It might be well to explain that while all but two of the rooms on the first floor require 78 square inches of the pipe area, and that 12-inch pipes with 113 square inches area are used to convey the air from the furnace to the bottom of these registers, the wall pipe, which continues

from the top of the registers to the rooms on the second floor, has an area of 35 square inches, and, inasmuch as each register is supplied with an adjustable diaphram, which can be used as a deflector, the warm air is divided while it is traveling upward, which is the only place that it can successfully be divided, and 55 cubic feet of air per minute is discharged into the rooms on the first floor and about an equal amount is discharged into the rooms on the second floor.

It is owing to the fact that the air for these two different rooms is divided, while it is traveling upward, or through a perpendicular conductor, that it is possible to successfully divide the air for the different rooms to be heated, while, if this division were undertaken while the air was traveling through a horizontal pipe, it will readily be seen that it cannot successfully be divided on account of the warmer air hugging the top of the supply pipe. If this division were undertaken while the pipe was running horizontally, the branch nearest the top of the supply pipe would naturally rob the supply pipe, and the branch would not get its share of the warm air; in which case, but one room would be heated successfully at one time, as has been proved in many cases. This no doubt has caused the prejudice referred to above.

In order that the description of this system may be more thoroughly understood, a plan of the basement is given, showing the location of the furnace, air ducts, warm air pipes, etc., also the first and second floors, which shows the location of the warm air registers, pipes, and return air registers. After finding the amount of air necessary for each room and adding all together, we find how much air is necessary. The next thing is to have a furnace large enough to allow this amount of air to pass through it between the castings, or the furnace proper, and the casings, and to have an air duct with sufficient unobstructed area to supply this amount of air. If this air is taken from the outside of the building, it will be well to remember that when heating it from a temperature of zero to 175 degrees above zero it will expand about 20 per cent., but if a greater allowance is made, the air supply in all probability will be

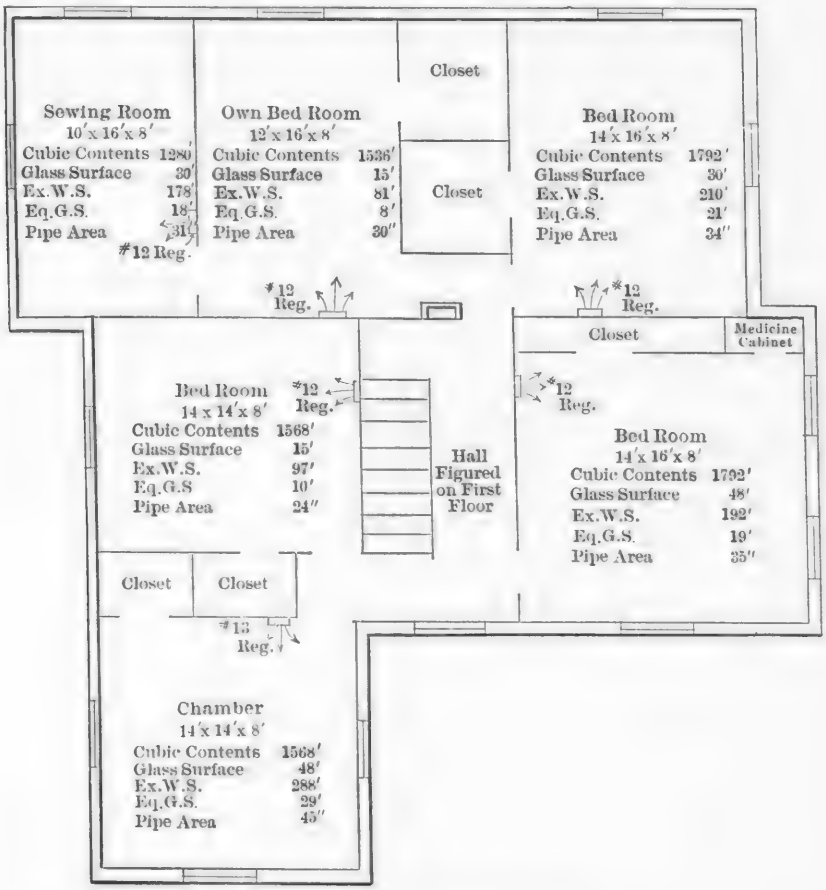


FIG. 3—SECOND FLOOR PLAN

inadequate; and more trouble has arisen in warm air heating from a lack of air than from a lack of heat, for it matters little how hot a furnace is, unless there is sufficient air delivered to it to utilize the heat as it passes over the furnace on its way to the rooms to be heated. Then, with a proper air supply, a furnace large enough to allow this air to pass through the warm air pipes, and the furnace so constructed as to heat this air while it is passing over the heating surface of the furnace, there can be no failure in warm air heating, if the rooms to be heated are properly ventilated, so that a circulation of air is secured, unless the warm air is cooled while passing through the basement pipes, and this can be prevented in a great measure by using a few large

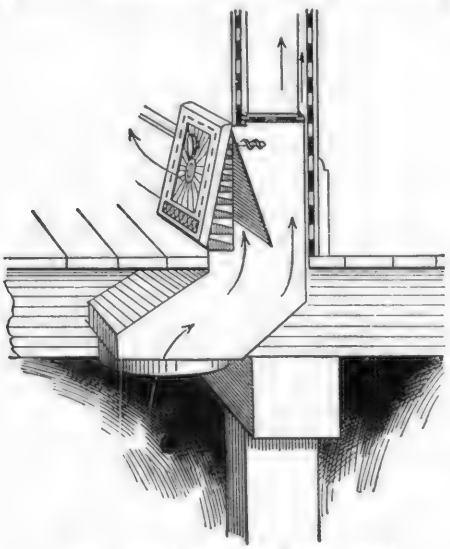


FIG. 4—FIRST FLOOR REGISTER

basement or supply pipes instead of using many small pipes or one for each rom to be heated.

Any furnace manufacturer will guarantee his furnace to heat more space where one larger register is used with one large supply pipe. Then is it not reasonable to suppose that a furnace will heat more space with the same amount of fuel with one-half the number of supply pipes, or the same space with less fuel.

As proof of this statement, you are referred to this residence, where but ten tons of anthracite coal was used to heat 23,548 cubic feet of space divided into thirteen rooms, where 2,267 square feet of wall is exposed to a climate where the thermometer registers as low as 22 degrees below zero, besides there being 504 square feet of actual glass surface, the cooling effect of which has to be overcome.

Besides successfully heating this residence with a minimum amount of fuel, all of the rooms have been ventilated and the air throughout the house is kept free from impurities, which cannot be said of some residences heated with other systems.

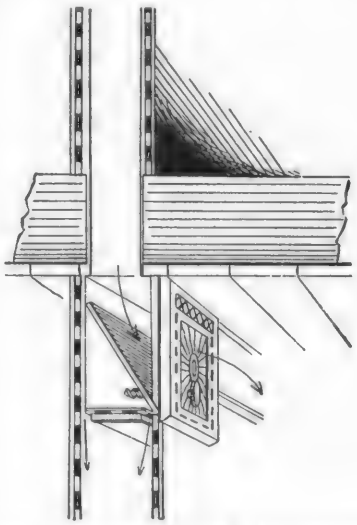


FIG. 5—SECOND FLOOR REGISTER

Another feature of this system of heating is that no coal dust or odor from the basement is delivered into the rooms, as no air from the basement can enter the warm air pipe; and air for protection, instead of being taken from the cellar or coal bin, is drawn out of the rooms being heated, through the opening at the bottom of the registers, which is made for the purpose of ventilating the rooms being heated, and protecting the wall pipes from overheating.

Summary.

Space heated.....23,548 cubic feet
Exposed wall.....2,267 square feet
Actual glass surface.....504 square feet

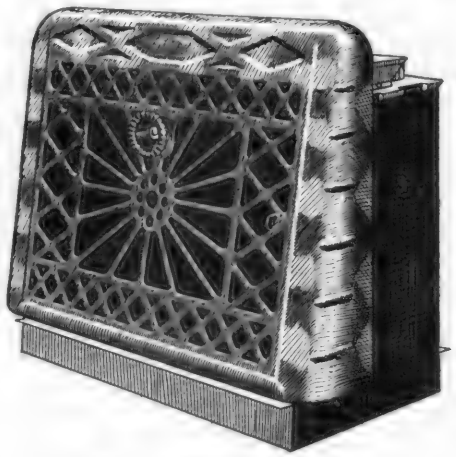


FIG. 6—SPECIAL REGISTER

Actual glass and equivalent glass surface 740 square feet
Number of rooms heated.....13
Number of basement pipes used.....7

Area of warm air pipes..740 square inches
Area of outside air supply,
592 square inches
Area of inside air supply,
740 square inches
Area of air space in furnace,
768 square inches
Diameter of grate in furnace...30 inches
Area of grate,
670 square inches, or 4.65 square feet
Heating surface of furnace
124 square feet
Coal consumed during season....10 tons
Proportion of grate to heating surface.....1 to 27 square feet
Proportion of heating surface to space heated.....1 square foot to 193 cubic feet
Proportion of heating surface to equivalent glass surface,
1 to 60 square feet
Proportion of grate area to exposed wall surface.1 to 46 square feet
Proportion of pipe area to space heated,
1 square inch to 31.08 cubic feet
Proportion of pipe area to equivalent glass surface,
1 square inch to 1 square foot
Proportion of coal consumed to space heated..1 ton to 2,354 cubic feet
Proportion of coal consumed to equivalent glass surface,
1 ton to 740 square feet

DISCUSSION

Mr. R. S. Thompson, Springfied, O. (a guest): Steam and hot air and the fan system have their places. The only process for many years to come, by which most people can change the winter of their discontent to glorious summer is going to be the hot air furnace. The hot air furnace has more need of the fostering of a society like this than steam and hot water, for it is much more backward. For the ordinary residence of not more than fifteen rooms the hot air system is equal to the hot water or steam system in every respect, and superior in many.

Now, I want to analyze some points of the address of Mr. Jones. He seems inclined to attribute the results secured to the use of large pipes in the cellar and two registers to each pipe. I have not any doubt that he managed to heat that house of thirteen rooms with ten tons of coal in the coldest winter, and I think Mr. Jones will back me up in the statement that he was able to heat all the rooms at the same time and to heat all those rooms regardless of which way the wind was blowing. That is the proposition that is the most often difficult.

At the same time I am inclined to think that Mr. Jones has attributed to the double pipe system, or the single pipe for a double register system, a good deal of the result which was due really to the very excellent system of installation he put in. To begin with, he had a big furnace, and there is one of the first errors that ninety-nine out of a hundred hot air men make. They undertake to put a carload on a little mule. He had a furnace with a 30-inch grate and with 124 square feet of heating surface. That is enormous. That would be equal to an ordinary furnace drum 48 inches in diameter and 10 feet high. And that is not all. He had, if you notice, what I call thoroughfares in the furnace. He calls it an air space. That is a free passageway, between the various obstructions of the furnace and the casing, equal to more than the total area of all his hot air piping. Now, that is an exception. Ninety-nine out of a hundred furnaces would have about half as much space there as the aggregate area of the hot air pipe, and that is why they fail. That is the second point wherein he succeeded.

The third point was that he was liberal in his use of hot air. He used 740 inches of hot air pipe, which is at least 50 per cent. in excess of the average practice.

And the last point in which he was most pre-eminently successful was that he secured a complete circulation of the air through his return flue registers, so that he overcame entirely the back pressure which arises from contrary winds. Now, contrary winds spoil a furnace by creating a back pressure, and if you have got a furnace which cannot deliver enough air to fill all the pipes, wherever there is back pressure those pipes are not going to be available. I have looked over hundreds of furnaces where they had difficulty and where they could not heat the exposed rooms. And in no single case did I find that they had capacity enough to deliver air enough to fill all those pipes at the same time up to their limit, and the consequence was as soon as they got back pressure against one pipe, the law of least resistance compelled the air to take the other pipe.

But Mr. Jones had air enough in his admissions, air enough through the furnace, air enough in his supply pipe to fill all these pipes at the same time to the limit of their capacity.

Another thing that caused his success in the matter of small fuel consumption was the large quantity of air. I am glad to see he presented the point that you cannot heat a house without air. When you burn a certain quantity of fuel you produce so much heat, and the only way to get it out is by the air. The way to raise the efficiency of your furnace to the highest possible figure is to have sufficient air, so that the temperature of the air in the furnace will be low. If you have so little that the air inside the casing will be heated up to 500 or 600 degrees, your waste going to the chimney will be about 500 or 600 degrees, while if you carry enough air through that furnace to keep the air temperature down to 200 degrees, you certainly ought not in a good furnace to have

over two hundred degrees in the waste of the chimney.

Professor Hoffman: In all our designing of furnace systems and in the selection of the furnaces, we have never been able to come down to a furnace as small as the heating men of our city have been proposing. We figure the heat loss for a building, then take a certain per cent. of efficiency of the furnace and assume then that with efficiency we shall need so much coal burned. We estimate about how many pounds of coal can be burned per square foot of grate, and from that we get the grate surface needed. I think in every case we have had to select a furnace with 25 to 50 per cent. more grate area than has been supplied by furnace men around our part of the country.

What would be your method of determining this? Would you take it from the grate area, from the heating surface, or from other conditions surrounding the furnace?

Mr. G. D. Hoffman: One thing has been lost sight of by the furnace manufacturers, and that is that hot air always tends to travel upward in straight lines. Fully 50 per cent. of the furnaces on the market are constructed with the fire pot flaring out and the combustion chamber tapering in. The air travel is deflected outward by the taper of the fire pot. The hottest part of the furnace is immediately over the fire, in the combustion chamber, and those lines are carried right away from the line of air travel. As the air cannot be heated except by contact, it should be deflected in against those surfaces. My contention has always been that a furnace or a steam radiator or anything of that kind, should be made with the lines of the heating surfaces parallel to the direction of the air travel.

I have been called a crank on the subject of a steel plate furnace. I have always contended that the fire was the source of all the heat in the furnace, and consequently that as the fire was the source of the heat, the less resistance that we would get between the fire and the air that we were trying to heat by the fire, the better results we were going to get. Another thing that is frequently lost sight of is the fact that it requires a certain mixture of air with the gases given off in order to permit thorough combustion. Now, the ordinarily constructed furnace does not have a sufficient combustion chamber in a great many cases. The result is that the gases are forced off into the radiator, and then into the chimney without combustion at all.

Mr. Blackmore: One statement that Mr. Hoffman made I think ought not to go unchallenged. That is regarding the conducting power of a furnace. Professor Carpenter and I have made some experiments, and all the heat that is taken up by contact, by either steel or cast-iron in any thickness up to three-quarters of an inch, will be conducted through more rapidly than the air can take it off by contact. Therefore, it is the experience of all the authorities that I have heard of that within reasonable thickness the conducting power of any metal is quite sufficient to conduct the heat as rapidly as the air can take it off, even under forced blast conditions.

Mr. Chew: When I was connected with a furnace concern, we undertook to sell in a district where they insisted on cast-iron construction, and we took off our superstructure of steel and replaced it with cast iron. It reduced the heating capacity of the furnace more than 20 per cent.

Mr. Jones: I would like to make a remark in defense of the article read a few minutes ago. While it is true that the large furnace and the large amount of air were factors in the successful operation, I wish to bring out the fact that there was but half the number of warm air conductors conveying that heat from the furnace to the rooms. There was less loss of heat in the cellar from friction and radiation, which can ony be obtained by the two registers on one pipe, or the two rooms being heated from one supply pipe.

The air in this case is drawn out of the rooms through the ventilator at the bottom of the register, where the air passes into the space between the inner and outer casing of the register, and from there upwards between the inner and outer casings of the double wall pipe to the attic, and from there to the chimney.

This house is not provided with fire places. A fire place makes a splendid ventilator for a residence heated with warm air.

By referring to the sketch you will see there are five outlets for air; they are taken out back through the main air duct, and are used only during nights, when the fire is allowed to run low. The air is taken from the house back to the furnaces and circulated until morning, when that is supposed to be closed, and air taken from the outside; the only ventilation in this particular case is through the register. According to the rules that have been followed in regard to ventilating rooms of this kind, it would appear inadequate, because the outlets are small as compared with the inlets, but the fact that this particular job does work successfully is evidence that a small constant outlet creates a circulation. The change does not take place four times an hour; I doubt if it takes place more than four times a day. Of course, at night, when the inside air is used, the change takes place rapidly and constantly. But ordinarily in installing warm air furnaces where a ventilating flue is supplied (this particular house was built before the question was given much thought), I have followed the plan of taking out of each room, the same amount of air as is brought in. This is conveyed to one main duct, which is connected both

with the ventilating stack and with the bottom of the furnace and supplied with a valve so the air can be turned from the furnace to the ventilating stack when outside air is used.

TOPICS NOS. 7 AND 8

"Is there any system of heating and ventilating school rooms by means of pressure or exhaust fans or both, which will not be thrown out of balance by opening windows?"

"Is it possible to positively change the air in a building a given number of times per hour?"

Secretary Mackay: I think it will be well for me to read a short extract from the law on heating and ventilating school buildings, which has been passed by the Legislature of New York State, and is now in effect, through the efforts of a committee of this society. The clause is this:

"Such commissioner of education shall not approve any plans for the erection of any school building or addition thereto unless the same shall provide at least fifteen square feet of floor space and two hundred cubic feet of air space for each pupil to be accommodated in each study or recitation room therein, and no such plan shall be approved by them unless provision is made therein for assuring at least 30 cubic feet of pure air every minute per pupil, and the facilities for exhausting the foul or vitiated air therein shall be positive and independent of atmospheric changes."

Mr. Macon: I believe some one has said that was the first state that has passed a law regulating the supply of air in school rooms. Is there not a law in Massachusetts on that subject?

Mr. Smith: It is a suggestive law—a permissive law.

Secretary Mackay: There is no compulsory law. The district police there have the power, the same as the board of health has in any other state, to close a building that is not in their judgment properly heated and ventilated, but there is no law compelling anything of that kind.

I would like to relate an incident in connection with heating and ventilating school buildings. The work of heating some hundreds of buildings in a certain city had fallen to the steam fitter, and he was happy. But a hot air furnace concern who make a specialty of heating school buildings arrived upon the scene and condemned the board of education for their methods, and their representative talked so well that the new school, the largest and best in the city, was given into his hands. The board of education built the heating plant, and he got the money for it. At the opening of the school he got a large audience there, and he said this was the only school in the city wherein the air was being changed six times an hour. Everybody was happy except the steam fitters. One of them with a long head and a roll under his arm requested the janitor to bring him a coal scuttle. He set it in the center of the room, undid his parcel which contained some tar paper, and put a match to it. Immediately the black smoke rose and filled the room. He said, "Now, gentlemen, the air in this room is being changed six times an hour. In ten minutes all of this smoke will be gone." They sat and sat, and the ten minutes went on to twenty and the twenty to thirty and to forty, and the smoke, while it was getting diluted and thinned down, was still in the room at the end of an hour.

TOPIC NO. 9

"Is there a better method of testing the efficiency of the steam radiator than weighing the condensation from it when it is surrounded by air at a stated temperature?"

There was no discussion of this and the secretary presented the following additional topic:

"Is it good practice to design an especial heating system by direct radiation to take care of the heating when outside temperature air is above, say, 30 degrees Fahrenheit, and supply the aditional amount of heat when the temperature is below that point?"

Secretary Mackay: It does not seem to me that that would be good practice. If there is any object in using a fan it is for the purposes of ventilation. If we need ventilation at a low temperature we need it also at a high temperature. It would be better in my judgment to heat the buildings in moderate weather with a fan and supplement it with direct radiation. In that way we get ventilation at all times and an extra amount of heat in cold weather.

Mr. Brennan: I think that would be a first class apparatus for a shop or residence or any kind of a building; to use direct radiation for heating, and the indirect radiation or fan blast system for ventilation. If the temperature were below zero it would require less direct radiation and more blast system, and if it were very cold it would require more direct radiation and less ventilated air. You change the air just as many times in cold weather as you do in warm weather, but you would require more direct radiation in cold weather than you would in warm weather, and in warm weather you could use the fan for changing the air where there was no radiation needed at all.

Mr. Feldman: The practice in shop heating is to use the air over and over again. They don't take in fresh air. That is the reason that ventilation by fans in shops is considered cheap.

Mr. Brennan: Some shops are heated in that manner, but there are a great many that take fresh air.

Professor Hoffman: It is very common

in our part of the country to have the fresh air taken in, and the fact that they can in almost all cases for their coils use the exhaust from their engines, makes it practically a cheap system. Where condensers are not used, they merely turn the exhaust steam into the coils regardless of the fact whether it is warm or medium cold. In very cold weather they turn in a little live steam, and it is more expensive. Still, the typical blower system takes a large part of the cold air from the outside. While I believe it is slightly more expensive, it is a more satisfactory system and works very well indeed.

It is a good thing at all times, cold or warm, for shop service. In extra cold weather, if you cannot get enough out of your blower system, it is time to look out for direct radiation.

Mr. Brennan: There would be times when, if the thermometer were 23 or, say 35 below zero, it would be almost impossible for a man to keep up steam to heat those buildings by taking air from the outside. I have known of school houses where they have had the blast system almost entirely, and the engineer would speed up the fans and try to heat the building. They were changing the air more times, killing the fireman, and burning a lot of coal. If the apparatus is put in in the first place large enough to overcome those cold temperatures outside, it would be too expensive to operate, and my opinion is that to successfully heat a public building it should be heated with direct radiation, together with a certain amount of the blower system added to it.

President Harvey: I think it is the universal practice now in all large buildings, to use about two-thirds direct radiation.

Secretary Mackey: It is also found to be of advantage in our school system from four o'clock in the afternoon to nine in the morning on week days, and from Friday evening until Monday morning every week, and through the Christmas and New Year's holidays. They can maintain sufficient temperature to heat the buildings thoroughly, and keep the plumbing from freezing by direct radiation, without operating the fan at all. They operate the fans for ventilating purposes after school is closed sufficiently long to extract all the vitiated air. They find it is an item of economy in running the plant.

Mr. Hoffman: We had a schoolhouse, in a little town I lived in several years ago, that was heated by direct hot water heat. There was no trouble in heating the school at all times, but it had no ventilation. They wanted me to go on the school board. I told them I would on condition that if I was elected the school house was to be ventilated. I was overwhelmingly elected and I put in a ventilating plant with a two-inch fan and a thirty-two-inch fire pot furnace, running the fan by a water motor. We apparently ventilated that school thoroughly. I never put any real test on it, but scholars who previous to the ventilation were continually coming home with headaches and complaining about feeling unwell, had none of that trouble after the ventilating apparatus was installed.

The fact that I want to bring out is that the fuel consumption was absolutely the same. We ran the fan all the time the school was in session, shutting it down and allowing the furnace and the hot air apparatus to heat the room during the hours between the letting out of the school and beginning next morning. The hot water apparatus was simply used as an auxiliary and run during cold weather, so that the furnace was doing most of the work, and yet the fuel consumption, with at least a half way system of ventilation, was identically the same as when it was heated simply with hot water.

Mr. Brennan: There are some doubts in my mind as to that fuel bill being the same. The weather might have been different or something, because if he changed the air in those rooms a certain number of times each day there certainly must have been more heat units used to heat that air.

Now, I would like to ask some of the members if they have any method of determining whether the air is changed in those different rooms. I know there are ways of doing it by holding an anemometer over the inlet register, and figuring out that you have so many cubic feet per minute going into that class room, and the supposition is if it comes in it will go out; but I would like to ask if the air is changed in the room, or if it comes in one pipe and goes out of another, leaving a good deal of the old air in there yet.

Mr. Jones: I had some experience in heating and ventilating school buildings with hot air, not with steam or hot water; but my experience in this particular school in Wauseon, O., would answer that question. We put in enough warm air furnaces to heat the school, which had eighteen rooms, and for each room we supplied an inlet of air sufficient to fill the room once every twenty minutes, with an outlet sufficient to take that amount of air out of the room. The blackboards were along the sides of the school room, while the heating and ventilating register was about the center of the side, and when the teacher would rub the chalk off the blackboard the ventilating face was white with chalk dust, which would indicate that the air was being driven out of the room other than directly from the register to the ventilator.

Mr. Collamore: Any consulting engineer will undoubtedly have had some experience with public boards where the appropriations were somewhat limited, and they are not always able to install the ideal system.

Now, in the school buildings here the idea has been to use the blower system for heating and ventilating school rooms, using direct radiation in the halls, toilet rooms and the principal's office, and figuring the radiation so that the halls can be heated to a very reasonable temperature, even as high as 75 degrees, the idea being that when the fan is not in use the direct radiation will at least take the chill off the building.

I was somewhat surprised to hear the gentleman remark that the fuel bill in this school which he refers to was no greater when the rooms were ventilated than before. In collecting a little data on that subject recently for school house work, the amount of coal burned seemed to run for a direct heating system about four tons per room, by direct radiation; whereas, by the ventilating system it seems to run somewhere about eight or nine tons, or nearly double. The gravity furnaces requiring just about as much as the fan system.

Secretary Mackay: In Mr. Hoffman's remarks about the amount of coal, it would seem that would be so, provided the hot water heater originally in the building was small and had to be pushed when only heating it in extreme weather. Then he supplemented his grate area by putting in a furnace with a thirty-two-inch grate—he had that much more capacity for generating and introducing heat, and as a result the hot water heater which had formerly been used for heating the building was only used as an auxiliary and could be run at a much lower temperature, and as a result would absorb a greater amount of fuel used in the heater. I think his saving in the ventilation was what he lost when he was heating by hot water and allowing the gases to pass up the chimney.

Mr. Hoffman: I was about to say that the hot water heater was utterly inadequate to the building, and in cold weather it had to be crowded to its utmost capacity.

Mr. Brennan: The point that I made was this, that he used more heat units after he had his fan going than before and if he was heating more air he was using more heat units.

Mr. Hoffman: Mr. Blackmore made the statement that it was demonstrated by a test made by himself and Professor Carpenter, that it was impossible to take the heat units off an iron plate as fast as the fire would transmit them. Now, that being true, the more air we can bring in contact with that surface, the more heat units we are going to absorb, and the less number of heat units we are going to pass into the atmosphere through the chimney. That is one reason why a blast system is more economical, as I have always understood that it was, than a system of direct radiation, simply because you are bringing more air in contact with your heating surface, thereby absorbing the heat that much faster.

Mr. Brennan: I would like to have some of the members express their views regarding a steam boiler run at low pressure for heating purposes, say from two to five pounds, and the same sized boiler under the same conditions run at high pressure, say 50 to 75 pounds, and reduce that pressure to the same conditions as the low pressure heating apparatus, using a pump or some other means of returning the condensation, using both apparatus as a heating apparatus. Which could you generate the most heat from, or which would supply the greatest amount of radiation?

Mr. Blackmore: I don't think there would be any difference in the efficiency of the boiler providing the low pressure boiler was properly piped and the conditions were good for low pressure. We would do no good by increasing the pressure on such a boiler by putting on a low pressure valve and introducing a return pump governor. If any difference, there would be a slight loss, due to the fact that carrying a higher temperature the boiler could not be quite as good an absorber of the heat in the gases of combustion. But in an actual test I don't believe any difference could be discovered, it would be so small; if, however, the apparatus was put up purely for a low pressure job with small piping, a great advantage might be obtained by increasing the pressure and making a mechanical return.

Mr. Munroe: To get any more capacity out of that boiler, you would immediately have to increase the grate surface in order to run it at high pressure. Then you increase the capacity of your boiler. The boiler would not develop any more power unless you burn more coal in that grate.

Mr. Brennan: The point was whether they could do it; not how much coal they would burn. Some people say you would have a better combustion at high pressure; while the low pressure man would say that he was absorbing more heat units because the water was colder. The question was could he develop more power, irrespective of the amount of coal he burned?

Mr. Hoffman: We all know that steam at a high temperature is much drier than steam at a low temperature. Now when we reduce the pressure of steam, the temperature is reduced by reason of its coming in contact with the air that is inside the pipe, and the result of that would be, looking at it from a theoretical standpoint, that there would be less moisture in the steam reduced from a pressure of sixty or seventy pounds, than there would be from a low pressure steam just simply carried into the pipe and circulated in that way.

The meeting then adjourned sine die.

RIVERSIDE RIPPLES

ANDREW HARVEY proved himself a capable presiding officer and a most hospitable host. Nothing was left undone to make the sessions interesting and the time outside of sessions enjoyable.

JAMES INGLIS AND GEORGE E. DOWNE are past masters in the art of entertaining. As presiding geniuses of the entertainment committee they were exactly in the right place.

THE BIGGEST summer meeting ever—both in point of members present and of spirited discussion, mostly by new men.

ALL THE LADIES liked Belle Isle, and it was the unanimous verdict that next to New York, Detroit is the star summer resort.

SECRETARY GOMBERS, of the Master Fitters, showed up in the guise of a physical wreck, but seemed to get better every day. Detroit air agreed with him.

J. H. DAVIS, Chicago, and C. P. Vanderveer, Buffalo, are both on the staff of Warren Webster & Co., but you would hardly have known it, as they declined to talk business.

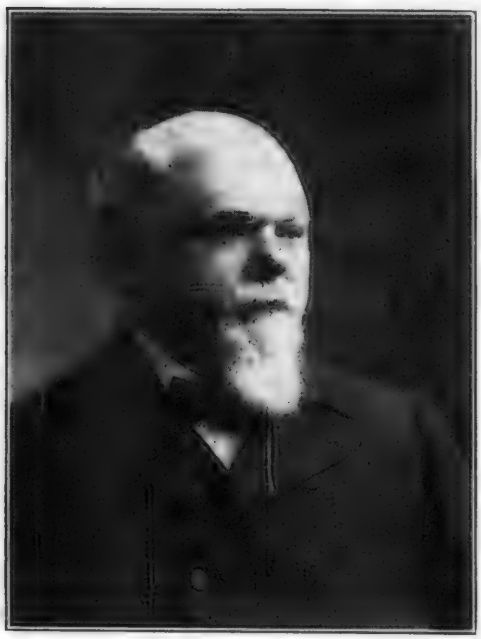
A. M. FELDMAN is a recent addition to the ranks of New York city consulting engineers and to the membership of the society. He takes an active part in all discussions.

W. M. MACKAY, the long-time secretary of the Society, distinguished himself by the excellent program and by the completeness of his arrangements in every way.

A. C. EDGAR, Philadelphia, known for many years in connection with the manufacturing business, is now a full fledged heating contractor of Philadelphia.

E. K. MUNROE, Baltimore, is a new member who got into the game at once.

PROF. J. D. HOFFMAN, Purdue University, LaFayette, Ind., made his mark last year at Niagara Falls, and this time he lived up to the reputation he then made.



ANDREW HARVEY, PRESIDENT

W. M. MACKAY, SECRETARY

J. W. STOCKWELL, New York, managed to spend a couple of days at Detroit in the course of a western business trip in the interest of his company, Lord & Burnham Co., Irvington-on-Hudson, N. Y.

AN ENJOYABLE FEATURE of the Detroit meeting was the trip from Buffalo on the handsome big steamer, which started in time to give a good daylight view of the harbor and city and reached the mouth of the Detroit river early enough for everyone to be up and admire that attractive bit of scenery.

Eastern men who made their route that way enjoyed every minute of it.

DETROIT is becoming a most progressive city, although a few years ago it was toddling along a few centuries behind the rest of the world in some respects.

It was the last city in the United States to adopt the trolley system for its streets, even after trolleys were in use in most western hamlets.

A Wisconsin steamfitter came over to Detroit one time and brought his two little girls. At the Michigan Central station one of the girls shouted, "There is a street car drawn by horses." "Where?" said her sister, "let me see." Neither of them had seen such a thing before, and deep was the chagrin of the Detroit entertainer.

G. RUSSELL LEONARD, official stenographer of the meeting is no novice in heating matters. He had charge of the correspondence of the old Detroit Heating and Lighting Co., in the 80's, and had plenty of opportunities for learning to differentiate betwen a gate valve and a steam boiler.

J. T. MacELFATRICK, Detroit, was an interested listener. He is one of the old timers, having started with the Detroit Heating & Lighting Co. in 1888, first as draftsman and afterward as engineer and traveling salesman.

GEO. D. HOFFMAN, Chicago, is an old furnace man, but he displayed plenty of wisdom about steam and hot water heating.

A. T. HOYT, of Warren, O., caused more stir than most people, by springing a vacuum hot water heating system on the assemblage, on top of his reversed circulation greenhouse heating system. He looked as if he rather enjoyed the sensation he created.

THE HOMEWARD TRIP from Buffalo by rail was not a pronounced success, as that Sunday was considerably hotter than any well regulated Sunday ought to be. If heaven is to be one eternal Sabbath, let us hope that it will not be like that one, or we shall want to try some other climate. Even those who availed themselves of the facilities of the "road of anthracite" and came through the Pennsylvania mountains on Miss Phoebe Snow's famous train made remarks about the superfluous caloric in the atmosphere.

J. S. BRENNAN, Milwaukee, Wis., made a new mark as one of the cleverest young members of the society.

THE TRADE PRESS gave special attention to this meeting. Assistant Editor Herlov, of *Domestic Engineering*, was there from Chicago; while from New York came F. K. Chew, of the *Metal Worker;* ——— Macon, of the *Engineering Record;* J. Graham, of the *Engineering Review;* H. N. Carruthers, of the *Plumbers' Trade Journal*, and H. A. Smith, of the HEATING AND VENTILATING MAGAZINE.

C. R. BRADBURY, a new member from Washington, wisely brought his family for a holiday trip.

THE BEAUTIES of the Detroit river did not escape the attention of the visitors, however they may have appeared preoccupied in other directions. The noble stream is bordered on the American side by imposing manufacturing buildings and on the Canadian side by pretty country places. Along the channel are islands dotted with summer cottages and peaceful farm houses, while all along are vessels of every kind, the greatest array on earth.

Sitting on the deck of the commodious steamer we looked out across the river and the land and watched the sun go down; and the most unpoetic waxed sentimental as the light changed and changed, and faded and went out, and the city and the ships became shadows, and then illuminations on the appearance of port and starboard lights and masthead lanterns, revolving light house lamps and thousands of electric lights flashing from the street pillars. It was a trip long to be remembered.

Greenhouse Heating Charts—No. 3

By JOHN A. PAYNE

The following table is the one referred to in our June issue as Table 6, and is designed as a supplement to each of the other charts in this series.

They are all based on zero outside temperature, and by the aid of this table, No. 4, they can be transposed to other temperatures.

TABLE 4*

RATIO FOR OUTSIDE TEMPERATURES, OTHER THAN ZERO

35	to	40	at	+10		30	to	35	at	0
35	"	40	"	—10		40	"	45	"	0
35	"	40	"	—20		45	"	50	"	0
40	"	45	"	+10		35	"	40	"	0
40	"	45	"	—10		45	"	50	"	0
40	"	45	"	—20		50	"	55	"	0
45	"	50	"	+10		40	"	45	"	0
45	"	50	"	—10		50	"	55	"	0
45	"	50	"	—20		55	"	60	"	0
50	"	55	"	+10		45	"	50	"	0
50	"	55	"	—10		55	"	60	"	0
50	"	55	"	— 20		60	"	65	"	0
55	"	60	"	+10		50	"	55	"	0
55	"	60	"	—10		60	"	65	"	0
55	"	60	"	—20		65	"	70	"	0
60	"	65	"	+10		55	"	60	"	0
60	"	65	"	—10		65	"	70	"	0
60	"	65	"	—20		70	"	75	"	0
65	"	70	"	+10		60	"	65	"	0
65	"	70	"	—10		70	"	75	"	0
65	"	70	"	—20		75	"	80	"	0

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THE HEATING AND VENTILATING MAGAZINE

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H. A. SMITH, EDITOR

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Foreign countries, - - - - 1.50 " "

THE paper by Professor Hoffman at the recent meeting of the American Society of Heating and Ventilating Engineers marks the beginning of more consideration of the importance of heating and ventilating than has heretofore been given to it in schools and colleges.

There are now several schools throughout the country in which considerable attention is being paid to a course in heating and ventilating, and it is well that the heads of the departments in which these courses are given should come before the Society for a discussion of the course. In most of the institutions, in fact, we believe in all, the course in heating and ventilating forms a part of the general course in mechanical engineering, and the student by being compelled to take the course in mechanical engineering acquires a broader training than he would get if he were allowed to enter the institution and take only a course in heating and ventilating. It must be remembered that the mere calculating of the loss of heat through walls of different kinds and the proportioning of boilers and radiators for given conditions is but a simple part of the knowledge which a heating and ventilating engineer should possess. In order that a man may rise in his profession and be an honor to it, it is necessary that he should know other things than merely those which pertain to the actual practice of his profession. He should be broad in order that he may deal with new problems. He should have a wide general fund of information and a deep knowledge of his specialty, whether it be heating and ventilating or something else. This is the view which we believe the engineers in the various institutions take of the matter, and it is for this reason that the course in heating and ventilating is usually made a part of the broad general course of mechanical engineering.

The question of the education of the heating and ventilating engineer is similar in many respects to the question of the education of any other special engineer, and engineers over the country and educators also take different views of the matter. Some think that a young man should specialize early in his course and should devote a great deal of time to his special branch of engineering, almost to the exclusion of other branches of engineering. Others take the position that the training of every engineer should be broad and that the college or institution should aim to turn out broad, well-trained engineers rather than specialists, with the idea that the engineer must make a specialist of himself after he has left the college or university. Those who take this latter view seem to be of the opinion that a broad general foundation with not much attention to any particular specialty is better than a narrow foundation with special attention to one particular branch of engineering. There are many examples of engineers who have graduated in one particular line and who have

specialized along one particular line while at college, but who in after life become specialists in some other line. Thus, a man might graduate as a mining engineer and become afterwards a specialist in heating and ventilating or in hydraulic work. In fact, a man who is well grounded in mathematics, physics, and applied mechanics is in a position to specialize in almost any branch of engineering. And when it is remembered that about all that a college or university can do is to teach broad general underlying principles, it seems to us that it may be wise to make the course in heating and ventilating a part of the broad general course in mechanical engineering.

THERE was one thing about the paper by Mr. A. O. Jones which we were sorry to see, and that is that Mr. Jones is not a member of the Society. It is too bad that a man who can do the work that Mr. Jones has done and who can write a paper such as the one he has written, is not a member of the Society. Our western members must see that Mr. Jones is brought into the fold.

ONE of the things which we admire about Mr. Jones' paper is the fact that he gives the rule by which he calculates the area of the pipe required for each room. His rule as we understand it is as follows: divide the exposed wall surface by 10; add this to the total glass surface; multiply this sum by 75 and add the product to the cubic contents of the room; multiply this sum by 0.013 and the product is the area in square inches of the pipe to supply hot water to the room. The area of the glass surface and the area of the wall surface must be in square feet and the cubic contents must be in cubic feet.

If we put this rule in the shape of a formula and let A represent the area in square inches of the pipe; G the area in square feet of glass surface; W the area in square feet of exposed wall surface, and C the cubic contents of the room in cubic feet, we have

$$A = 75\left(G + \frac{W}{10}\right)0.013 + 0.013C$$

$$= 0.975\left(G + \frac{W}{10}\right) + 0.013C$$

For all practical purposes it is close enough to say that 0.975 is equal to 1, and as 0.013 is equal to 1 divided by 75, we may say that it is equal to 1 divided by 80. Then our formula becomes

$$A = G + \frac{W}{10} + \frac{C}{80}$$

For rooms on the second floor multiply the area as given by the formula by 0.4: That is to say, because of the elevation, the pipe supplying air to a room on the second floor will be only 0.4 the area of the pipe supplying air to the same room if on the first floor.

This is an exceedingly easy formula to use, and we have been interested in noticing how the areas actually provided by Mr. Jones agree with the results obtained by this formula. In some cases the areas provided are almost exactly the same as those given by the formula. In other cases they differ a good deal. Thus, the dining room on the first floor has a glass surface of 51 feet; a wall surface of 237 square feet; and cubic contents of 2,304 cubic feet. So that G is 51; W is 237, and C is 2,304. Putting these values in our formula we get

$$A = 51 + \frac{237}{10} + \frac{2304}{80}$$
$$= 51 + 24 + 29 = 104$$

Mr. Jones has provided a pipe area of 103 square inches.

For the bedroom on the first floor we have G is 30; W is 114, and C is 2,016. These values in our formula give for the pipe area

$$A = 30 + \frac{114}{10} + \frac{2016}{80}$$
$$= 30 + 11 + 25 = 66$$

Mr. Jones provides a pipe area of 75 square inches.

For the sitting room we have

$$A = 60 + \frac{246}{10} + \frac{2304}{80}$$
$$= 60 + 25 + 29 = 114$$

Mr. Jones provides for this room a pipe area of 103 square inches.

For the bedroom on the second floor over the dining room we have

$$A = 30 + \frac{210}{10} + \frac{1792}{80}$$
$$= 30 + 21 + 22 = 73$$

But since this room is on the second floor the result must be multiplied by 0.4, and 0.4 times 73 equals 29 square inches. Mr. Jones provides 34 square inches.

For the sewing room on the second floor we have

$$A = 30 + \frac{178}{10} + \frac{1280}{80}$$
$$= 30 + 18 + 16 = 64$$

And this multiplied by 0.4 gives 26 as the required pipe area for this room. Mr. Jones makes the pipe area 31 square inches.

For the chamber on the second floor,

$$A = 48 + \frac{288}{10} + \frac{1568}{80}$$
$$= 48 + 29 + 20 = 97$$

And this multiplied by 0.4 gives a pipe area of 39 square inches. Mr. Jones provides a pipe area of 45 inches.

We think it would be interesting for other furnace men to use Mr. Jones' rule, or rather the formula which we have produced from Mr. Jones' rule, in testing up some of the work which they have installed and which they know works well.

If it be possible to get a short rule such as Mr. Jones proposed that will give good results when applied to furnace work, it will be of great value to furnace men and in fact to the whole heating profession, and the use of such a rule would tend to bring about a better condition in regard to furnace work and would put it on an engineering basis where it belongs and lift it out of the slough of guess work.

WE wish to urge strongly upon two classes of men the great importance of joining the American Society of Heating and Ventilating Engineers.

In the first place, there are those eminent engineers who feel, perhaps justly, that they could get no new ideas and derive no benefit from participating in the proceedings of the Society, and who perhaps feel that they cannot afford the few hours of time required each year. Our judgment is that they are mistaken on both of these points and that no one can discuss subjects pertaining to his profession, even with men of much less experience and ability, without acquiring some new ideas. Assuming this to be true, we think that no engineer desirous of keeping fully abreast of the best thought in his line can make any better use of his time than to attend these meetings.

Without regard to the question of

benefit to them, we submit that it is no small part of the duty of a man eminent in any line of effort to do such things as he reasonably can do for the general elevation of that profession or specialty, and there are at least two or three names not on the roll of the Society which ought to be there, whose presence would benefit the Society and therefore the profession even if no benefit accrued to the owners of those names.

The other class comprises younger men who could join only as juniors. From almost every technical school in the country there have lately graduated and are about to graduate a few men who have at least a half formed intention of making something of a specialty of heating and ventilating. Such men should put in their applications for junior membership. They will thus become identified with their future specialty, will become known to men whose colleagues or competitors they are going to be and will have not only the right but some incentive to attend the meetings of the Society, participate in its discussions and lay before it such new thoughts of theirs as they would like to have criticised and passed upon by men of experience.

A man leaving Sibley College, for example, and opening an office as heating engineer or connecting himself as heating engineer with someone, will be immediately and directly benefited financially by the fact of his name having appeared for a year or so on the roll of members of the Society. He will have a sort of half-acquaintance with the majority of leaders in the line.

We urge upon both these classes of men that they connect themselves with this very worthy Society.

AN important benefit in our judgment was derived by the Society from its summer trip to the Middle West; that is the development of a new line of speakers.

At the New York meetings the floor has been mostly occupied year after year by about the same men. In the published proceedings, of the last five or six years, we think it would probably be found that about three-quarters of the space is occupied by something like half a dozen men. They are all good men, men of the highest standing in the profession, men whose utterances command respect everywhere.

At Detroit, the absence of most of the regular leaders of debate was noticeable. Among the prominent absentees, these names suggest themselves to us: Carpenter, Kent, Kinealy, Jellett, Wolfe, Barron and others who have been ready to discuss whatever paper or topic was before the meeting. It will be good to see them at the next meeting, but there will probably be others to help them bring out new ideas and discuss matters of experience and experiment.

AN important legal decision has handed down by the Supreme Court of Illinois, in regard to taxation of corporations doing business in the state, and of the stock of those organized under the state law.

It is held that where the estimated fair cash value of a stock exceeds the assessed value of the tangible assets of the corporation, the stock may be assessed to the extent of such excess of the cash value of the stock over the previously assessed tangible assets.

This means in brief that hereafter in the State of Illinois, good will is to be assessed and taxed as well as tangible assets.

SMOKING COMPARTMENT REFLECTIONS

I fell against a cheerful bunch of heating men at Springfield, Mass., the other night. (My stenographer wrote this "eating men" and she was right; but how did she guess?) There were H. A. Joslin of the New York office of Powers Regulator Co., White of Jenkins Bros., Boston office; R. D. Reed and Sisson, of H. B. Smith Co.; Blinn of A. B. Franklin Co., and a newspaper man from Canada. The reminiscences of early days which this bunch of veterans produced were many and entertaining.

Another group that looked like the annex of a steamfitters' convention, I encountered in the new Lafayette Hotel at Buffalo. It was largely an American Radiator Company crowd, headed by President C. M. Woolley with Messrs. W. C. Hill, F. B. Howell, and a dozen others. Then there were Thomas Cushing, C. P. Vanderveer, Pratt & Millard, of Frankfort, N. Y.; A. C. Edgar, of Philadelphia; H. S. Welsh, of Rochester; Fred Vaux, of Buffalo, and a few more. The first named were attending a meeting of plant manufacturers, some of the others were waiting for the Detroit boat and the rest just blew in.

I am always glad to see John Allen make a new move because it is generally a pretty good one. The new size and make-up of Domestic Engineering is most attractive and as it has my approval, the success of it may be considered practically assured.

I am glad, and so is everyone else to hear of the recent advancement of John Duncan. For years and years he has done more than his share in making the name and the goods of the Westers Tube Co. famous. Incidentally, he has made himself very popular. He has been the jolliest of good fellows and the hardest of hard workers. You could find him anywhere between Boston and San Francisco, looking for business by day, and in hours of relaxation surrounded by congenial friends. Now he is Mr. Vice-President, if you please, but can be counted upon to keep right on working as industriously as ever. He cannot do any better.

Hon. James H. Blessing is one of the experienced old steam engineers of the country and he has some funny things to relate.

He told me the other day of going to Wisconsin, where one of his traps was in use on the heating plant of a large educational institute. After much correspondence and explanation for the engineer the president of the institution insisted that Mr. Blessing must come West and set the thing right because his trap was not working properly.

Arriving on the scene of action it was found that every room in the building was cold, with apparently no steam at all in any of the pipes or radiators. Going to the cellar he found 40 pounds pressure on the boiler. Investigation showed that the valves on the feed pipes were pretty nearly shut off, throttling the flow of steam to a minimum. He started to open the valves and the engineer expostulated. He said if those valves were opened his pressure would immediately go down and if he could not heat the building with 40 pounds he surely could not do it with any less. Mr. Blessing, however, proceeded to open the valves and the engineer exclaimed, "There; what did I tell you? See my gauge go down!"

and immediately began firing hard, but reiterating his pessimistic view that he would never again be able to get that pressure up with the valves open.

Of course, in this case the expected happened. The pressure did go down to about 4 pounds as the engineer expected and he was moved to tearful lamentations; also, the steam filled the radiators and the professor soon came rushing down stairs to say that the heat was coming and the rooms getting warm.

I do not know that this story has an awful lot of novelty because that sort of thing used to be pretty common years ago, and when hot water heating was first introduced I have known of a man going 500 miles to open an air valve.

Perhaps such incidents are impossible to-day; certainly they are rather unusual.

Minnicoganashene is a nice name for a place, particularly if the nearest post-office is Penetanguishene. It is not difficult to guess that it is somewhere in Canada, and it is there that a recently married couple, lately mentioned in our columns, are spending the summer. It is pretty safe to say that nobody will write to them.

Jeremiah Dwyer, President of the Michigan Stove Works, is one of the grand old men of Detroit. Seeing Jefferson avenue reminded me of an incident of many years ago.

I was smoking on the front platform of a horse car eastward bound on Jefferson avenue. The rest of that smoking compartment was filled with molders smoking their clay pipes. As we passed Mr. Dwyer's then comparatively new mansion, one of the molders took his pipe from his mouth and said: "There is Jerry's new house; I wonder is he a better man than he was when he lived in the little brown house under the hill?"

The man spoken to smoked a minute or two, and then said: "No;" puff, puff, "he couldn't be;" puff, puff, "he was a good man then and he is a good man now. God bless him."

A fine tribute to a man who started as one of themselves and could hardly have reached his present position without stepping, at some time, on somebody's toes.

H. A. Joslin of Powers Regulator Co., is an enthusiastic Mystic Shriner. Incidentally, he is an enthusiastic surf bather. Consequently when he was at Atlantic City last month, attending the encampment of Mystic Shriners, he took occasion to go swimming.

While he was enjoying himself, in the breakers, he saw the life-saving crew starting out to rescue somebody. As they came back, he looked with mild curiosity to see who was the prospective victim and found that the life-savers were bringing to shore the wife of his bosom.

Fortunately, Mrs. Joslin was only tired out and had to be helped home, but no unpleasant consequences resulted.

A large gob of lightning fell on the Flatiron Building the other day and knocked off its beautifully symmetrical flagstaff. What is worse, it scared a couple of heating men off the premises. Leastwise, 'tis stated that Walter Appleton and Howell Johnson are running yet. Last I heard of them was up in the Bronx, on the Boston Post road, both going strong, but Johnson having a slight lead, due partly to his superior length of limb and partly to his long experience, running with "the masheen" in Jersey.

A widow whose husband was killed by lightning was consoled—let us hope—by the assurance that lightning never strikes twice in the same place. With that in view, perhaps, our friends will take the trolley home and resume their normal vocation of selling Triton radiators and Winchester boilers.

CORRESPONDENCE

A Little Criticism

Philadelphia, July 25, 1904.

Editor HEATING AND VENTILATING MAGAZINE:

Thanks for opportunity to subscribe to HEATING AND VENTILATING MAGAZINE. It took but half a second to see that it is up to date. Please keep it so. One of the most interesting parts to the man of action will be the Correspondence section.

Perhaps criticism is out of order; but would it not have been better had the cut on page 56 been so constructed that one would not have to stand on his head to read half of it; in other words, one part reads upside down to the other part. Were we to follow that example in setting radiators, some would have their legs sticking up into the calorified air while others were decently standing on their legs in a very moral attitude.

But your magazine is a credit to you and well worth what you ask for it. Of course, next year we all expect to see the subscription advance about 300 per cent. I enclose check for advance subscription for a year.

JOHN GORMLY.

It Is the Thing

Jersey City, July 11, 1904.

Mr. H. A. Smith,

Dear Sir:

Enclosed find $1.00 for subscription to your new magazine which I think is "the thing." Please commence with No. 1, and if this amount is not correct, let me know.

Sincerely yours,

WM. H. DRISCOLL,
Consulting Engineer.

Measuring Radiating Surface

Editor HEATING AND VENTILATING MAGAZINE:

Dear Sir:

I read the letter from "Wants to Know" in your July number. I have wrestled with that some problem and I think your answer is entirely right. If Mr. "Wants to Know" will take a 20 gallon tank, fill up the openings and immerse it, he will find that it displaces 20 gallons plus the thickness of the metal. Now, if he will open that up and flatten out the iron he will have just twice as much surface as he had before because the inner surface will now be exposed; but will he displace 40 gallons of water? He will not displace half a gill.

That shows that it all depends on the shape of his radiator. If it is a perfect cylinder, it will displace the greatest possible quantity of water in proportion to its surface, while if it is nearly flat—in very thin columns—it will displace the least possible quantity. S. L.

Pump and Ejector in the Webster System

Editor HEATING AND VENTILATING MAGAZINE:

Acknowledging receipt from you of information with regard to that part of the discussion upon the topic of "Vacuum Systems of Steam Heating" during the convention at Detroit, and the evident failure to have the question by Mr. E. K. Monroe satisfactorily disposed of, owing to the temporary absence of two members of the Society connected with our company, with regard to the function of the "Ejector" as employed in the Webster System, permit us to state:

The function of the Ejector employed in the Webster System, where but one vacuum pump is installed, is to act as a "relay" for this one pump in case it requires packing or repairs, thus not causing any interference in the usual operation of the plant. It is, therefore, simply for temporary use and affords a measure of relief under the conditions noted. As the Ejector is neither as economical or efficient as a Vacuum pump, its use is therefore limited to the purpose stated.

WARREN WEBSTER & Co.

A Suggested Unit of Labor

Editor HEATING AND VENTILATING MAGAZINE:

Having read the paper written by Professor Hoffman for the Detroit meeting of the American Society of Heating and Ventilating Engineers, I wish to suggest, as an addition to his various sheets, an estimate sheet.

In that estimate sheet a specially difficult item for a young man starting out from college, or a young steamfitter with little experience, is to know what constitutes a unit of work; that is, what a day's work should be.

In the old times an average radiator was usually called a day's work, and that averaged about a 50-foot radiator. Now there are some people who use the same superficial surface as an estimate for the labor on piping. No matter what the size of the pipe may be, 50 feet of the surface of the pipe—not its length—constitutes very closely a day's work and I think that 50 superficial feet of pipe may be regarded as the unit of work.

You would have to take the heating surface of the boiler at units of 50—each 50 feet of the heating surface of the boiler—and that would lead to the establishment

of something very desirable, because when you are selling labor, one man will do more than another, but there is an average day's work and as nearly as I can get at it, it seems to me that 50 superficial feet may be figured as a day's work.

In New York and Philadelphia, for example, there is much power work—coils, indirect radiators, traps, etc.—but that unit of superficial pipe pretty closely approximates a day's work of 8 hours.

I just heard of a job where the labor estimated was 300 days and the actual time was 800 days. I have had similar cases, though not perhaps so extreme, in my own experience. Many men guess at it. A good guesser is very desirable in the heating trade, but this establishment of a basis would be of great assistance to the best guesser.

The thing that is making all the trouble in the world to-day is labor, and if we can get it to a scientific basis in our field, it will be very desirable.

The foregoing is a crude attempt to establish a unit of labor for steamfitter and helper. If an average day's work can be defined for pipe work it will lead to more exact and satisfactory labor conditions.

H. J. BARRON.

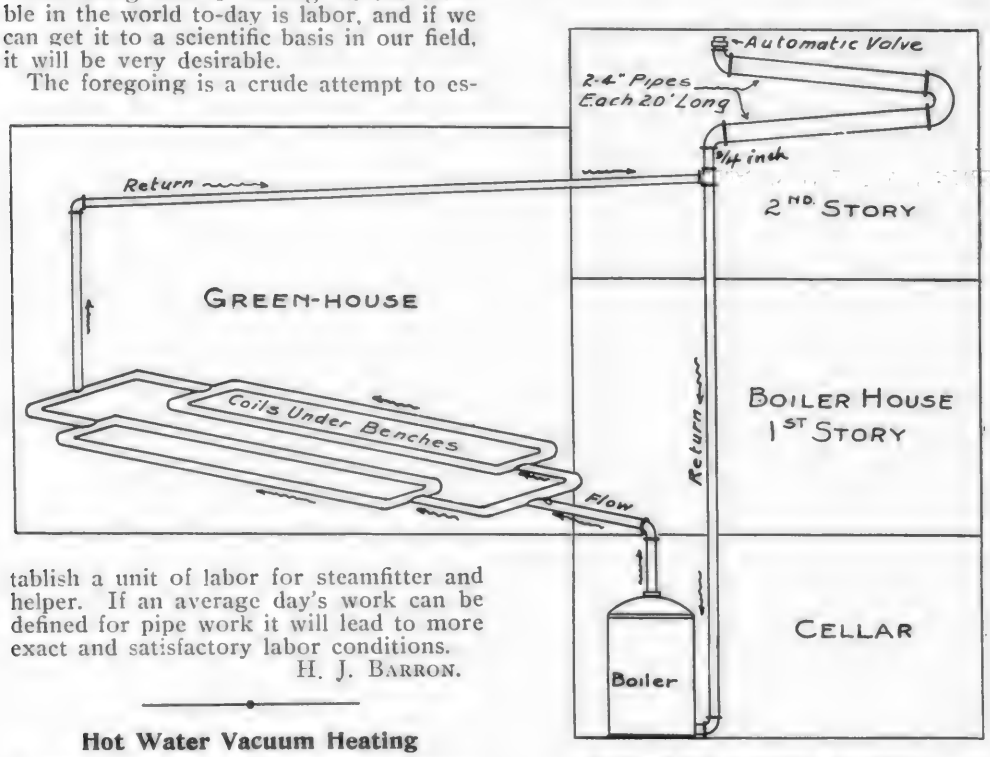
Hot Water Vacuum Heating

Editor HEATING AND VENTILATING MAGAZINE:

To further explain my remarks at the Detroit meeting of the American Society of Heating and Ventilating Engineers, I send you a number of sketches from which you can make a drawing showing what I call my system of heating greenhouses by "vacuum hot water."

The boiler house is three stories high, the boiler standing in the cellar, my "expansion tank" being in the third story. The flow pipes pass out close to the floor of the first story to five different greenhouses. In each one, the flow pipe is divided into two branches, each of which supplies a coil under the benches of flowers, the pipes rising from the boiler house toward the far end of the greenhouse. At the end, the coils are again connected into a riser through which the return is brought back with an upward pitch, entering the second story of the boiler house and thence dropping down to the bottom of the boiler.

At this high point a ¾ inch pipe connects to the lower end of a 4 inch pipe about 20 feet in length, from the other end of which a return bend connects to another similar pipe. Both these have an upward pitch and from the closed end of the latter a ¾ inch vertical pipe terminates in an automatic valve made of a ½ inch union with a solid gasket. This prevents air entering when the water contracts, or when a vacuum is formed by drawing water out of the boiler. In extremely cold



HOT WATER VACUUM HEATING

weather the pressure can be carried up to any reasonable point. These 4 inch pipes are about 14 feet about the boiler and the high point of the return pipes about 10 feet about the boiler.

This arrangement of the pipe allows the plant to be run in four different ways, namely: steam, vacuum steam, open tank water and vacuum water, vacuum water being the most economical in fuel and attention, and vacuum steam coming second.

A. T. HOYT.

Aside from the "vacuum system" the unusual circulation of the hot water heat-

ing pipes and coils, with the return blowing upward, is not new, having been advocated for years by Mr. Hoyt.—[ED.]

Editor HEATING AND VENTILATING MAGAZINE:

I was at the Detroit meeting and heard Mr. Hoyt present his scheme of "vacuum hot water heating," and some of the members and guests of the Society expressed the view that the creation of a vacuum at the high point of a hot water system might possibly accelerate the circulation. I do not see how this could be expected. Suppose you have a system, say 25 feet high from the return at the bottom of the boiler to the highest point in the system. If you have water in the system to a depth of 23 feet that would leave 2 feet of air space above the water and, with an open tank system, the pressure at the bottom would be about 10 pounds and at the surface of the water it would be nothing. Now if you make a closed system of that and introduce pressure, at the top or anywhere else in the system of say 10 pounds, then the pressure in the air space at the top would be 10 pounds, while the pressure at the bottom would be 10 pounds plus the 10 pounds head of water, or 20 pounds.

Now if, on the other hand, you exhaust air and create a vacuum of say 10 inches, then the pressure inside of your expansion tank would be 5 pounds less than atmosphere at the top, while at the bottom it would be 5 pounds less than atmosphere plus the 10 pound pressure of the water, leaving a pressure of 5 pounds above atmosphere.

I cannot see how either of these performances would in any way affect the movement among the particles of water heated at the boiler and cooled in the radiators.

Pressure put upon water in a closed system affects equally all parts of the tank or system and a vacuum acts in exactly the same way. If the theory advanced at Detroit is correct and a vacuum at the top would give the water a tendency to rise, then a pressure applied at the top would tend to accelerate the down flow of the water, which would be quite as good as helping the upward circulation; but either a vacuum or pressure at the top or anywhere else would act just as strongly upon the return pipe as upon the flow pipe and leave the thing just where it was before.

In short, I believe that a "vacuum hot water heating system" is a dream.

C. T. J.

He Says It's Good

Norwich, Conn., July 27, 1904.

Have read the magazine through. It is very good.

JOHN TROLAND.

NEW DEVICES

Utilization of Exhaust Steam

The Standard Steam Specialty Co., 542 W. Broadway, New York, lay special stress upon the value of their combined "Utility" exhaust muffler, oil separator, return tank, pump governor and water heater.

A few months ago they received a report of one of their systems which was particularly gratifying by virtue of the especially imperative requirement.

In breweries the water must be entirely free from oil or any other contaminating substance, and while brewery engineers have recognized the saving to be effected by the direct utilization of the steam exhausted from their engines, pumps, refrigerating machines, etc., for heating boiler feed water, the fact that the steam from the boilers is in turn employed directly for heating purposes has deterred many from utilizing it. Steam exhausted from the engines, pumps, etc., unavoidably carries with it, in minutely divided particles, oil used for lubrication of these machines, and the presence of these oil particles in the beer, in water used for brewing, for cleansing brewery utensils, etc., would be fatal to the flavor of the beer and render it unfit for use.

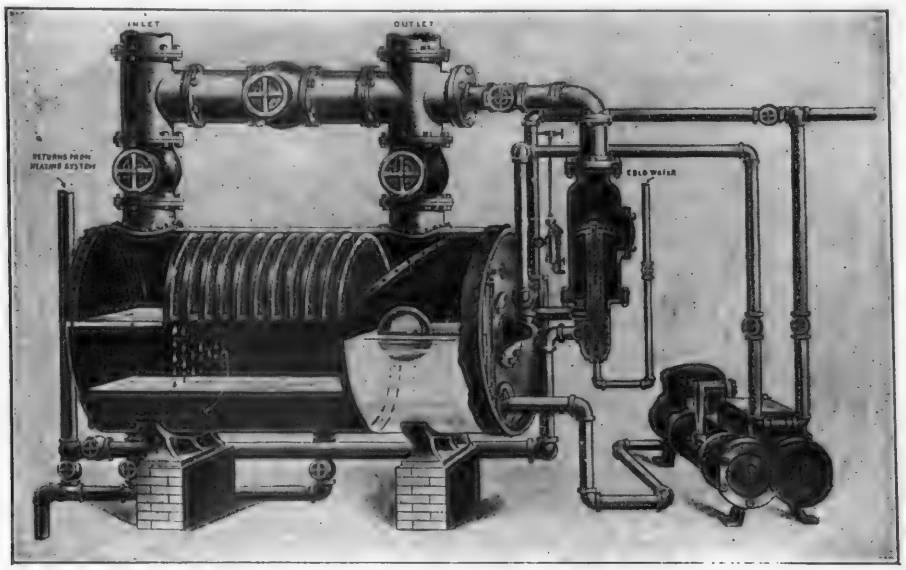
The "Utility" exhaust heating system apparatus seems to show that it cannot only fully utilize all the caloric of the exhaust from engines, pumps, etc., but can also perfectly separate from it all oil, grease, etc., so that it can be used with perfect confidence for boiler feed water.

The "Utility" apparatus was installed in 1898 in the plant of the Central Brewing Co., New York, in a 16-inch exhaust pipe, with boiler capacity of 1,200 horse power. All the exhaust condensation has been returned to the boilers since the plant started, and with this system of heating the boiler water, if the separator did not do perfect work, the brew master would know at once, as the least oil in the steam would make its presence disastrously evident in the beer. Since the above date, the separator has never been opened or cleaned, substantiating the manufacturers' guarantee that it takes care of itself and is self-cleaning.

In February, 1903, on account of a closed feed-water heater in the plant getting out of repair, the "Utility" heater was connected to the "Utility" combination, and heats the boiler water to 212 degrees, supplying the entire boiler plant with feed water. The size of the heater doing the above work is 10 inches in diameter by 49 inches high. Mr. Matt Koenig, C.E., of this brewery, writes as follows: "Our

steam plant was originally laid out to trap to the sewer all condensation from the exhaust steam, as we were afraid with the ordinary oil separator to return to the boilers on account of the oil. We decided, after thorough investigation, that the 'Utility' was all the manufacturers claimed for it, and, having adopted it, found, after nine months of constant use in our main exhaust pipe of 16 inches, that it separated all of the oil, and we have not found a trace in our boilers.

"We were of the opinion, before finding the 'Utility,' that it was impossible to save all of the water from the exhaust steam for brewery work, and are pleased to report that we consider it a perfect mechanical oil separator and a good investment for any brewery to adopt, or any plant where exhaust steam can be utilized for different purposes. You are at liberty to refer any interested party to us, as we have more than saved the cost of the 'Utility' in fuel and water expense."



PAT. AUG. 8, 1897; MAY 31, 1898. OTHER PATENTS PENDING

The accompanying illustration shows the "Utility" Exhaust Muffler, Oil Separator, Return Tank, Pump Governor and Feed-Water Heater; being five devices in one, it simplifies the piping and saves space. The main object of this combination is to return all of the condensation from the exhaust steam automatically to the boilers, and in doing this, to extract the grease from the exhaust steam before it enters the heating system or pipes. By separating the oil from the steam, advantages are very great, and the boiler steams easier and saves fuel. Beginning with the oil separator, as shown, it will be seen that the steam enters the tank and is materially expanded in volume and decreased in velocity. The proper expansion of the exhaust steam is obtained by building the tanks proportioned according to the horse power of the engine. The next step from expansion is the breaking up of the volume of the steam by means of chains suspended on frames, as shown in the illustration. These frames holding the chains are placed in the tank separately, and they are so constructed that the chains in one frame come opposite the space between the chains in the next frame, so that the exhaust steam, in its passage through the tank, strikes all of the chains, muffling the noise of the exhaust and separating the oil from the steam, so that it runs down the chains into the chamber provided for removing it from the tank. In a number of plants using this apparatus the cylinder oil is saved and filtered, and used over and over and over again, and in one case the engineer of a plant of two 500 horse power condensing engines states that the cylinder oil expense for 1,000 horse power is less than one pint per day.

The steam from the outlet of the "Utility" passes through the building, heating the radiating surfaces, and the returns and clean drips are returned through the heater and stored in the pump governor end. The make-up water is handled in a like manner. From the pump governor the water is returned to the boilers by means of a duplex pump which is automatically controlled by the pump-governor valve shown in the illustration.

Brennan Circulating Valve

The valve which we illustrate herewith is designed specially for hot water radiators. Its main objects are to permit

swinging the radiator away from the wall for the purpose of finishing, repairing or cleaning behind it without interfering with the circulation of the heating medium and also to facilitate the connection of the radiator with the supply return pipes.

The trouble and annoyance incident to setting and connecting a radiator with two pipes in or above the floor in the usual way are avoided by this improved connection, which requires but a single round opening to be bored in the floor and a single coupling to be made in or above the floor.

By using the "Brennan Circulating Valve" the entire job can be roughed in complete, using only a wrench to connect the radiators, which can be done very quickly, having but one ground union joint to make. No pipes to cut and fit, no floors to spoil by shifting the radiators. No spoiling of the ceiling by leaky pipes. No stiff connections to connect. The radiators can be connected when the roughing in is done and swung away from the wall, to allow for finishing or for temporary heating and swung in place again when the building is completed. More sections can be added at any time and the radiator enlarged without disturbing the connections.

It is not necessary to connect all the radiators for temporary heating or to cross connect the pipes, as the "Brennan Circulating Valve" has a circulation in itself. By using the "Brennan Circulating Valve," much less pipe and fittings is necessary, hence the cost of the apparatus is greatly reduced, not only by such saving in the price of material, but also the cost of labor in connecting same.

The accompanying illustration is a section of part of two loops of a radiator and of a radiator connection. The description accompanying it is as follows:

a designates a valve divided by a partition *b* into inlet and outlet passages *c* and *d*. The horizontal arm of the valve is screwed into the opening in the lower part of a radiator *e*, the partition *b* extending through the first section of the radiator and cutting off the other sections from the inlet passage *c*. The inlet passage *c* is provided with a valve *g*, the stem of which passes through a removable cap *h* at the upper end of the vertical arm of the valve and is provided with a handle *i*. To the lower end of the vertical arm of the valve is swiveled, by means of an internally-threaded collar *j* and a flanged nipple *k*, the upper cylindrical part of a hollow head *l*. This head is expanded at its lower end and provided on opposite sides with threaded inlet and outlet openings for the attachment of the supply and return pipes *m* and *n*. Between these openings a partition *o* is fitted to turn in the cylindrical part of said head and is adapted to be attached at its upper end to the partition *b*, of which it forms a continuation. To guide

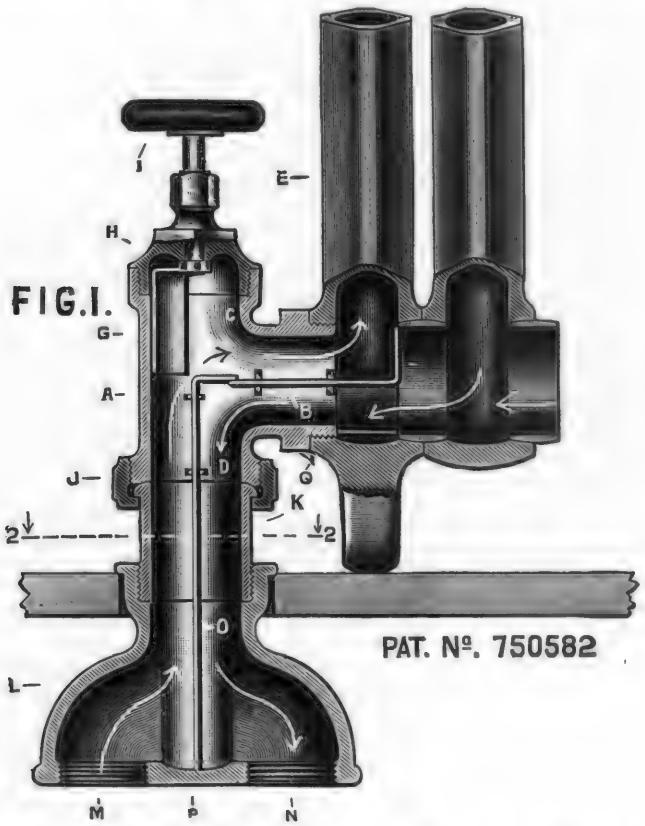


FIG. I.

and hold the partition *o* in place and facilitate its turning, it is provided at its lower end with a rounded end *p*, which has a bearing in the bottom of the head *l*.

To indicate how far a radiator may be

turned without affecting its inlet and outlet connections, the valve a may be provided with an index or mark *q* and the upper end of the head *l* with marks *r*, determining the limits within which the partition *o* may be turned in the head *l* without establishing communication between the inlet and outlet passages therein.

This valve is made by the A. J. Lindemann & Hoverson Co., 340 Florida street, Milwaukee, Wis. They have an attractive little booklet which will be sent on application.

"Richardson" Round Boilers

A recent addition to the list of excellent hot water and steam heating boilers is the "Richardson" round boiler, which we illustrate herewith.

As will be seen by the sectional cut, there is a heavy substantial base, equipped with a rocking and dumping grate, each bar of which is operated independently and can readily be removed.

The round firepot has an unusually large water leg to insure rapid circulation and to maintain a steady water line in the steam boiler, positively preventing the lifting of water. The inner surface of the firepot is deeply corrugated, greatly increasing the extent and efficiency of the surface.

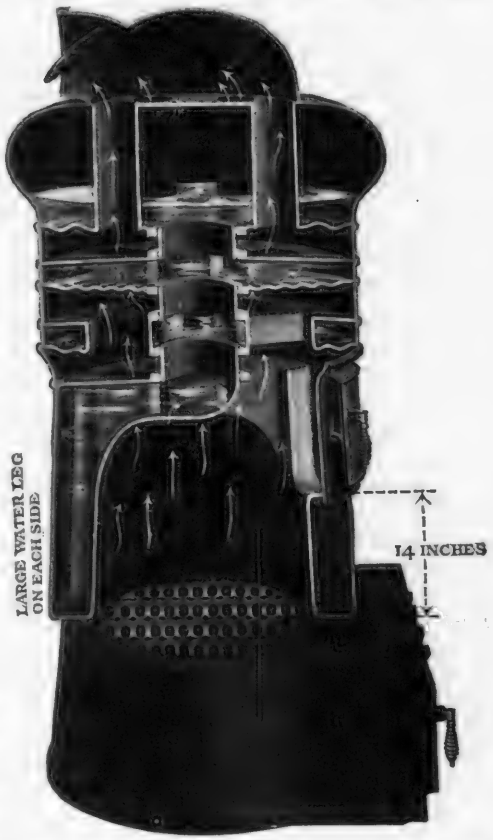
From the surface of the grate to the fire door there is a depth of 14 inches so that an ample body of coal can be admitted to maintain a continuous good fire; from the surface of the coal to the crown sheet is space for an adequate combustion chamber.

Above the firepot are a series of tapering water sections, connected by six-inch machine-turned screw nipples, absolutely tight ad durable. The sections are so constructed as to baffle the fire travel up through the boiler, bringing the products of combustion into direct contact with all the boiler surface.

In the steam boiler the top dome is unusually large, making a chamber for reserved steam in the boiler, a necessity which will be greatly appreciated.

Such a boiler as this is sure to be durable, effective, economical and easily managed.

This boiler is made in eight sizes, with grates ranging from 18 to 24 inches; the ratings for steam range from 300 to 650



square feet of radiating surface, and for hot water from 500 to 1,075 feet.

This boiler is manufactured by the Richardson & Boynton Co., 230 Water street, New York.

The Unions and the Building Business

Now we have another building trades war on in New York. This time the employers took retaliatory measures very promptly upon the violation by the unions of the existing trade agreements, and the result is a lockout of the building trades for twenty-five miles around New York.

This looks like another step in the direction of the open shop. If the unions insist upon using their power to retard building operations, to embarrass employers and discourage property owners, doubtless their influence must be in some way curtailed.

The most likely result seems to be the establishment of the open shop, the mere mention of which agitates the union men.

One union delegate, in arguing against the open shop, advanced the proposition that it would be a very bad thing for the employers because of the likelihood of journeymen making contracts directly with owners.

This would make it necessary for the owner to purchase the material, which probably he would find it quite difficult to do on a basis that would make it at all profitable for him.

In the past it has frequently happened that the journeyman made his start in somewhat such a way, but that usually occurred in places where there was an absence or a scarcity of master fitters. For a journeyman to continue work as a journeyman and rely for employment upon owners would be a very precarious means of livelihood.

The employers, on their side, seem unwilling to declare for the open shop, and some of the officers of the New York Employers' Association lately stated that they did not desire it, because they preferred to continue doing business with the unions.

There is entirely too much objection to the open shop. It does not imply the death of the union by any means. Probably the unions are a permanent factor in our industrial life, but probably also the course pursued by many of the unions makes the open shop equally inevitable.

Advertising

When advertising is done it is not always the most popular medium that is best adapted to the needs of the manufacturer or dealer, and he must make a judicious selection. In the majority of cases the high-class paper which charges most for its space receives the attention of more real buyers than papers that are more widely circulated. Another important fact that the advertiser must learn is that the advertisement will not do it alone. It is just as essential to have intelligent salesmen as it is to advertise.—*Metal Worker.*

No Campaign Scare

The campaign scare cannot be utilized to the extent it has been. The country is in less apprehensive mood about the policies of the opposition. Adroit leaders cannot prey upon the business world's fears.—*Washington Post.*

Trade Golf

The Eastern Trade Golf Association is still busy and has now arranged a match with representatives of the heating contractors of New York, the match to be played at the Fox Hills links, Staten Island, August 10.

The play will be as follows: Captain Barrett, of the Eastern Trade Golf Association, will play Mr. Burdick, of the New York Steamfitting Co.; Mr. F. H. Simmons, of the John Simmons Co., will play Mr. Hadden, of the Baldwin Engineering Co.; Mr. Molby, of the Pierce, Butler & Pierce Mfg. Co., will play Mr. Herrick, of the Baker-Smith Co.; Mr. McLain, of the Backus Heater Co., will play Mr. Brisze, of the Baker Smith Co.; Mr. Fink, of Dimock & Fink Co., will play President Hall, of the New York Steamfitting Co.; Mr. F. C. Jennings, of Bruce & Cook, will play Mr. Armagnac, assistant to the Secretary of Master Steam & Hot Water Fitters' Association.

The Eastern Trade Golf Association have provided six mugs as prizes for each of the winning teams. Pierce, Butler & Pierce Mfg. Co. give a cup to the best gross score in the morning play which will be a handicap match and the association gives a cup for the best net score.

From an outside point of view it seems clear that the Golf Association has its competitors beaten in advance, although there may be some surprises.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Secretary Gombers, of the National Association of Master Steam and Hot Water Fitters, went to Detroit partly for the purpose of attending the summer meeting of the American Society of Heating and Ventilating Engineers, of which he is an associate member, but more particularly in the interest of his association. He reports that as a result of his visit and of correspondence arising therefrom, a strong movement is on foot looking to the formation of a Michigan State Steam and Hot Water Fitters' Association, to be affiliated with the National Association. Several prominent Michigan master fitters met Mr. Gombers in Detroit and they all seem to appreciate the importance of organization.

TRADE AND MISCELLANEOUS NOTES

W. A. BUTLER, Syracuse, N. Y., died July 11, at the age of 52. He was one of the organizers of the Pierce, Butler & Pierce Mfg. Co., which was established in 1876, but owing to ill health retired from active business several years ago.

Previous to that time he was interested in many of the most important enterprises

of the city. He was active in the state militia, having passed through the grades from lieutenant to colonel of the Fifty-first Regiment and afterward being appointed, by Governor Cleveland, major and then colonel on the staff. He was also a thirty-second degree Mason.

Mr. Butler was a brother-in-law of W. K. Pierce.

GURDON G. WOLFE, of the Fowler & Wolfe Mfg. Co., Philadelphia, died at his residence, the Park Side Apartment, Philadelphia, July 18. He was taken suddenly ill at the company's office Saturday, July 16, and never recovered consciousness, passing away the Monday following.

Mr. Wolfe was born in Troy, N. Y., September 22, 1831, and was the son of William H. Wolfe, of Sullivan, Grant & Wolfe, at that time (before steamboats) the largest ship owners on the Hudson river.

His first business experience was in the wool and the wholesale grocery business, but about 1853 he started as one of the

CLASS A. RETURN TRAP.

The Albany Return Steam Traps

have been the **STANDARD** for over **THIRTY-TWO YEARS.** For returning water under pressure to the boiler, they will perform this duty fully as well, and in many cases better than the so-called steam loop.

Send for circulars A, B, C and D.

MANUFACTURED BY

ALBANY STEAM TRAP CO., ALBANY, N.Y.

FREDERICK TOWNSEND, PRESIDENT

JAMES H. BLESSING, GEN. MGR.

early pioneers the manufacture of stoves at Troy, being connected successively with the firms of Saunders & Wolfe, Wolfe & Warren, Hicks & Wolfe, and Fuller & Warren. He was perhaps the oldest stove manufacturer in the United States.

In 1896 he associated himself with the late A. H. Fowler and, with others, incorporated the Fowler & Wolfe Mfg. Co., the originators of wall radiation. He was actively engaged as president and treasurer of this corporation until the time of his death.

All who knew him will appreciate the loss of faithful friend and an honorable business man.

Mr. Wolfe is survived by his widow and one son, Wiltsie F. Wolfe.

MODEL HEATING & PLUMBING CO., Mitchell, S. D., has been incorporated with $75,000 capital. President, E. C. Barnes; vice-president, J. D. Gridley; secretary, G. E. Barnes.

L. H. PRENTICE CO., Chicago, has been incorporated in the state of New York with a capital of $300,000. Directors, L. H. Prentice, Chicago; W. L. Canfield, New York; O. H. Hubbard, New York.

CRANE CO., Chicago, has increased its stock from $7,000,000 to $10,000,000.

THE ERA HEATING CO., Providence, R. I., has been incorporated by F. H. Taft, T. W. Parker, and L. H. Walters, with a capital of $100,000.

R. A. PENICK & SON, South Boston, Va., have added a steam heating department to their hardware business.

ADJUSTABLE WRENCH & SPECIALTY MFG. CO. has been organized at Oshkosh, Wis., by P. M. Knippenberg and F. W. Hahn. They manufacture a wide variety of wrenches.

JOHN D. MOUAT CO., Detroit, Mich., has been incorporated by John D. Mouat, Annie Mouat and Carleton H. Deane.

CENTRAL GEORGIA PLUMBING & HEATING CO., River street, Macon, Ga., is a new organization.

DURABLE STEAM TRAP CO., Youngstown, O., has been incorporated to manufacture Morgan-Bletso steam traps.

KENTON PLBG. & HTG. CO., Kenton, O., is a new company managed by W. J. Burkart, and will have offices in the Scioto block.

THE ÆOLIPYLE

When applied to the Smoke Collar of a Furnace

SAVES Time, Labor, Coal.

PREVENTS Escape of Coal Gas.

GIVES Additional Heat and an even Temperature night and day.

Recommended by Furnace men. Specified by Architects. Adopted by the United States Government.

In use by thousands of individuals, as well as Railroads and School Boards.

Send for illustrated Booklet and Trade Discounts.

***ÆOLIPYLE CO.*, 237 Water St., NEW YORK.**

J. RILEY has started in the heating business at Camden, N. J.

GROZIER PIPE COLLAR CO., has been incorporated at Hartford, Conn., to make plumbing and steam fitting specialties. Capital stock, $50,000.

AT A SPECIAL MEETING of the directors of the Fowler & Wolfe Mfg. Co., held at their office, Bourse Building, Philadelphia, on Monday, August 1, appropriate action was taken and resolutions passed concerning the death of their late president, Mr. Gurdon G. Wolfe, and new officers of the company were elected as follows:

Wiltsie F. Wolfe, president and general manager.

Charles R. Fowler, secretary and treasurer.

PHELPS BROS. are pushing their boilers and specialties for all they are worth, and that is a great deal. They are the swiftest comers of the new men in the heating specialty business.

BOYNTON FURNACE CO., 209 Water street, New York, have about all the business they care to atend to, in spite of some rather depressing features in the city trade, so they do not complain at all about this year's work thus far.

J. C. FAULKNER presides with easy grace over the New York office of the H. B. Smith Co. Andrew Mercer, the manager for so many years, has been disabled by illness for many months.

UNITED STATES RADIATOR CO. are having an excellent demand for their fine line of goods. The Triton family of boys know how to sell them.

KELLOGG-McCRUM-HOWELL CO. are getting their new premises into fine shape and are going to have a display of goods, and provision for the comfort of their force, second to none.

PRATT CHUCK CO., Frankfort, N. Y., are making manufacturers and the trade see the value of their zinc-coated slip nipples.

NORWALL AIR VALVES keep right on working to the front under the energetic generalship of George D. Hoffman.

AEOLIPYLE CO., New York, are just beginning to get real busy. The late summer and early fall constitute their harvest time and they get a bigger harvest each year.

NEW YORK TRADE SCHOOL, First avenue and Sixty-seventh street, New York, issue the catalogue for their twenty-fourth season.

The Sunray Steam Boilers

AND WATER HEATERS

are made in over **ONE HUNDRED SIZES,** from 150 to 9,000 feet steam, and from 150 to 15,000 feet water. Factories at New York and Pittsburg. .·. .·.

GET OUR LATEST PRICES

THE J. L. MOTT IRON WORKS

84-90 BEEKMAN STREET **NEW YORK, N. Y.**

It is a very comprehensive and well executed catalogue and young men of this locality who can take advantage of the night class should get copies of it, as should also embryo steam fitters of the country at large, who can see their way to taking a course in the day classes.

The day classes in steam and hot water fitting will begin January 14, 1905; the evening classes, October 10, 1904. Application for admission should of course be made earlier.

ABENDROTH & ROOT MFG. CO., Newburgh, N. Y., issue a special return mailing card, inviting inquiries, in regard particularly to the Root spiral riveted pipe, made from 3 to 10 inches in diameter.

BOYNTON FURNACE CO., 209 Water street, New York, are giving special attention to school heating, and describe their school heater as among the heaviest, largest and most desirable on the market. It has large radiating surface and is practically self-cleaning.

ARMOUR INSTITUTE OF TECHNICOLOGY, Chicago, send us their year book for 1904-5. It is a book of 184 pages, full of information regarding the varied and comprehensive work of the Institute. The heating and ventilating course as set forth in this book seems to be complete and thorough.

As is generally known, the Institute has connected with it an excellent correspondence school, whereby most if not all the courses may be taken by students at a distance or engaged in work preventing their attendance at regular sessions.

Copies of the catalogue will be sent to interested parties on application.

POWERS REGULATOR CO., Chicago, invite everybody to take a look at the United States Government Exposition of the Bureau of Standards Laboratories, Block 29, Electricity Building. The rooms are artificially cooled and the temperature accurately controlled by the Powers system.

CENTRAL RADIATORS are for the first time adequately presented in an attractive catalogue of 32 pages, done in black with a yellow tinted border on excellent paper, having a gray cover printed with a most appropriate design in black and red.

The book shows a very complete line of radiation, ranging from single column to four column, plain and ornamental, in varying heights; also Story's patent wall radiators.

The catalogue is sent out by the Central Radiator Co., 116 Nassau street, New York, factory at Lansdale, Pa.

"DON'T BE A CRAB AND GO BACKWARDS," is the rather aggressive suggestion of A. J. Lindemann & Hoverson Co., Milwaukee, Wis., on the first page of their little booklet describing the Brennan circulating quick opening hot waer radiator valve.

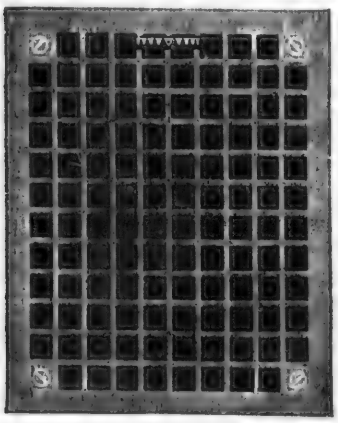
The valve is described on another page of this magazine, but it would be a good idea to get the catalogue and prices.

SYRACUSE STOVE WORKS, Syracuse, N. Y., send us their latest circular, which is devoted to their several specialties.

THE LORD TAPER PIPE REAMER is described in the circular sent out by the manufacturers, L. L. Lord Co., Meadville, Pa. This high class reamer is adapted to pipe from ½ inch to 2 inches diameter. It can readily be taken apart for transportation and is a most valuable tool.

"WHAT WILL BECOME OF THE EXHAUST STEAM?" is the subject of a little booklet issued by the Warren Webster Co., Camden, N. J. It is needless to state that its contents are interesting and profitable to heating contractors.

AMERICAN BLOWER CO., Detroit, Mich., send out an elaborately designed card advertising "ABC" disk fans with the Westinghouse motors.



Kernan Registers

ALL SIZES AND FINISHES
WE CAN SAVE YOU MONEY

Syracuse Stove Works,
SYRACUSE, N. Y.

Telephone, 383 John.

NEW YORK BRANCH,
231 Water St.

U. S. RADIATOR CO., Dunkirk, N. Y., have a new 48-page catalogue devoted of course to the famous Triton family. It includes the new Triton wall radiator and the still newer box base for the direct-indirect.

HENDERSON THERMO heaters are described on a little mailing card sent out by the Prizer-Painter Stove & Heater Co., Reading, Pa. The cut shows how the half-sections are connected with the water base and the top header, and the consequent effect upon the durability, etc., of the boiler.

PENN, JR., positive and automatic radiator air valves are set forth on the back of a little desk blotter, distributed by the Penn Engineering Co., 312 Cherry street, Philadelphia, Pa.

TRIUMPH HEATERS are being pushed by Phelps Bros., 210 Water street, New York, who distribute a very handsome little catalogue showing the construction of this very excellent line of goods.

WRIGHT MFG. CO., 38 Woodbridge street, Detroit, lay special stress upon an improved high pressure steam trap, designed to instantly discharge the largest possible volume of water in an emergency without wasting steam.

"HEATING INVESTMENTS SUCCESSFUL" is the title of the latest advertising brochure of the American Radiator Co. It is a tersely expressed argument in favor of the equipment of modern homes with the best modern system of heating. The headlines of the pages are models, and pretty nearly tell the whole story, while yet compelling the reader to peruse the entire page. As is the case with much of the literature of this company, the object is to aid the heating contractor to secure more and higher priced business.

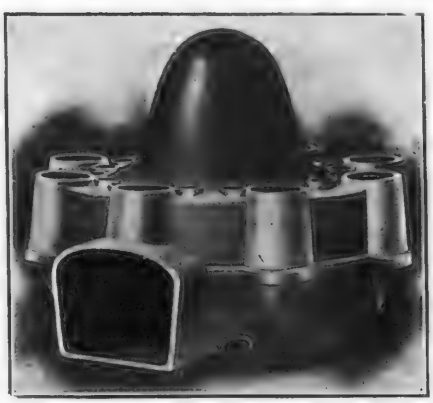
MAGEE FURNACE CO., Boston, Mass., claim special advantages in their wood burning furnace, which is made in four sizes, 22 to 31-inch fire pots.

U. S. HEATER CO., Detroit, issue a new illustrated price list of Capitol boilers and radiators.

THATCHER FURNACE CO., New York, are issuing a folder of six good sized pages, describing "Three Profitable Propositions." These are, needless to say, the steam and hot water heaters and ranges and warm air furnaces made by this company. Enclosed is a large mailing card for the use of the recipient in asking for catalogue and prices.

Thatcher Tubular Warm Air Furnaces

WARM THE AIR.



Burned air is not the product of a Thatcher Furnace—freshly warmed air **IS.** The dome shaped Tubular combustion chamber offers such a large radiating surface that the air cannot become overheated. The large volume of warm air circulates rapidly through the house. Points like these, when combined with a proved economy of operation, appeal to intelligent consumers. Put yourself in touch with our selling methods. A postal brings our salesman.

THATCHER FURNACE CO.,

WORKS:
NEWARK, N. J.

240 WATER ST.,
NEW YORK CITY.

HENRY R. WORTHINGTON has published a small map showing the location of the old works in South Brooklyn, the offices in Manhattan and the new works at Harrison, N. J., with the intercommunicating lines of transportation. The old works were founded in 1840, and now cover about four and one-half acres, employing 2,000 men. The new plant occupies a 34-acre tract, has 18 acres of floor space and will accommodate 6,000 workmen. It is said to be the largest industrial plant near New York and embraces the latest improvements in production engineering.

SIX MONTHS of snow and ice outdoors with warmth and comfort in-doors is the experience of some Utica people quoted by the International Heater Co., whose advertising blotter shows the first snow by a photograph taken October 28, 1903, and "still snowing," a photograph taken April 20, 1904. That is a long winter for even International boilers.

O'MEARA VALVE CO., 97 Warren street, New York, have produced a fine catalogue of their special valves and valve parts.

ARTHUR McGONAGLE, 136 Liberty street, New York, issues a small folder briefly suggesting the advantages of the McGonagle vacuum system of steam heating.

POWERS REGULATOR CO., Chicago and New York, send us a copy of their descriptive book for 1904. A point brought out in strong type is the following:

"We are the inventors of the method by which mixing dampers in the fan heating systems are operated with a graduated motion."

The plans of various systems are lucid and well done and the description of the Powers apparatus and its workings well set forth.

The latter pages of the book are devoted to fine half-tones of an imposing lot of conspicuous buildings wherein this system is used.

Books will be sent to interested inquirers.

CONSOLIDATED ENGINEERING CO., 40 Dearborn street, Chicago, issue a very attractive little catalogue.

KNOWLES PUMP WORKS, 114 Liberty street, New York City, are distributing Bulletin K-73, describing their recently designed "Express" pump. This pump is of the reciprocating type and is directly connected to an electric motor without gears or belts, and a 250-gallon pump runs at a speed of 300 revolutions per minute. In a test, the details of which are given, this pump showed an efficiency of 93 per cent. Pumps of this type are built in capacities of from 200 to 4,000 gallons per minute and for heads from 100 to 2,000 feet.

ELMO AIR VALVES

AUTOMATIC FLOAT

LOCK SHIELD AUTOMATIC FLOAT

First class, high grade goods. Close by flotation and expansion. Many special features of excellence which will be readily appreciated : : :

PHELPS BROTHERS

210 Water Street New York

HEATING and VENTILATING BUILDINGS

Prof. R. C. Carpenter's standard work; latest edition; 577 pages, 277 cuts. **Price $4.00.**

HEATING AND VENTILATING MAGAZINE

1123 Broadway, New York

RICHARDSON & BOYNTON CO., New York and Chicago, send us their new catalogues 59 and 60. Catalogue 59 is a very complete catalogue of the "Perfect" heating furnaces and cooking ranges and the "Richardson" boilers for hot water and steam. It is an exceedingly handsome book of 165 good sized pages printed on heavy coated paper with excellent cuts, showing clearly the external appearance and the internal construction of the various goods which it describes.

Catalogue 60 is devoted entirely to the Richardson sectional safety boilers and to the round boilers.

We would suggest writing for catalogue 59, because it contains all that is in catalogue 60 with a little more.

Heating Contracts

P. Yockel, 3418 Third avenue, New York, heating two tenements, M. Meehan, Longwood avenue, New York.

Raisler Heating Co., 17 East Twenty-second street, New York, heating four flats, Barnet Levy and Jos. Rosenthal, West 143d street, New York.

Adolph Hoffman, Orange, N. J., heating residence, Mary A. Koniger, Midland avenue, East Orange N. J.

Curtis Bros., Tarrytown, N. Y., heating school, Irving, Tarrytown, N. Y.

John Collins, Passaic, N. J., heating Garrett Hopper Estate, Paterson.

C. Lang, Carlstad, heating residence, E. C. Hopper, East Rutherford, N. J.

Rudolph A. Koether, Newark, N. J., heating residence, Frank Holweiler, Milford avenue and Bigelow street, Newark, N. J.

Theo. Geiser & Son, Newark, N. J., heating bungalow, Jacques Hotel, De-Graw and Grafton avenues, Newark.

McNeil Bros., Winthrop, Mass., plumbing and heating club house of Winthrop Yacht Club.

Frank Foy, Philadelphia, hot water heating store and dwelling, 2804 Germantown avenue.

Charles G. Nash, Norwich, N. Y., heating John O. Hill block and first floor of Daniels block.

J. P. Donnelly, 928 W. Dauphin street, Philadelphia, heating 32 houses, 17th street and Glenwood avenue.

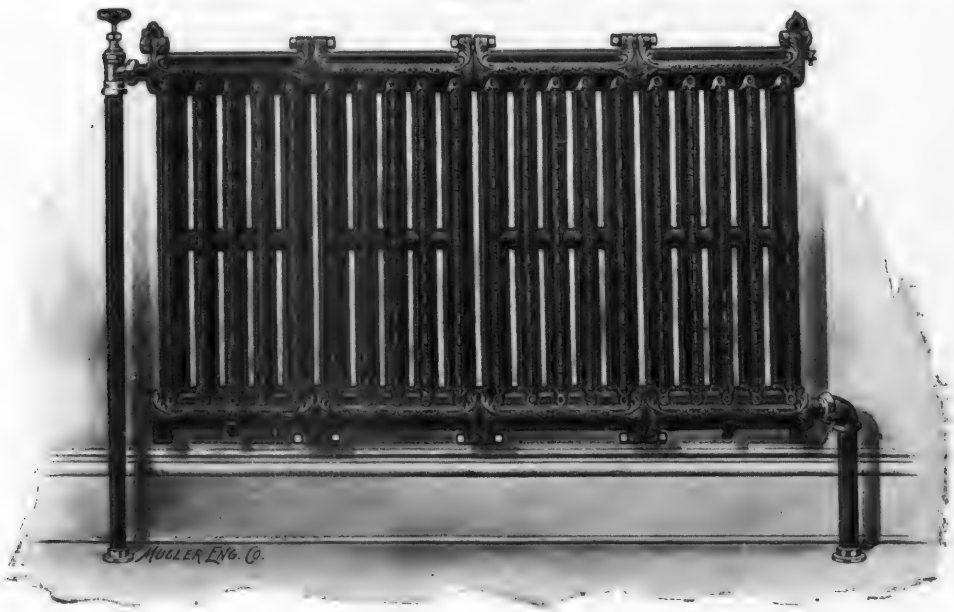
John F. Sayward & Co., 21 W. 24th street, New York, steam heating officers' quarters and chapel, Annapolis, Md.

M. S. Kellogg, S. Orange, N. J., heating and ventilating school building.

Roberts Leineau, 11 South Seventh street, Philadelphia, heating Weimer building.

"Novus" Wall Radiator

PATENTED



Slip Nipple Connections Consequent freedom from leaks when many sections are combined in one radiator. Easily assembled without special tools. **Artistic in Appearance**

National Radiator Company, Johnstown, Penn.

A. E. Powell, Findlay, O., plumbing and heating People's Bank building, Columbus Grove.

Baker, Smith & Co., New York, heating Remington Construction Co., 59th street and Madison avenue.

Sayles Co., 446 Fourth avenue, New York, heating residence at New Rochelle, N. Y.

New York Steamfitting Co., 137 Elm street, New York, heating Mercantile building, 23d street and Fourth avenue.

H. E. Wieber, 28 E. 20th street, New York, steam heating Grand Hotel, Catskill Mountains.

Crocker & Andrews, 242 Fourth avenue, New York, hot water heating new antelope house for Zoological Gardens at Bronx Park.

Mulhearn Steam Heating Co., 401-403 W. 59th street, New York, heating apartment building, 96th street and Park avenue.

Welch Bros., Lowell, Mass., heating residence on Eleventh street.

Peterson Engineering Co., New York, heating two large apartment houses, 140th street, east of Broadway.

Mulhearn Steam Heating Co., 401-3 W. 59th street, New York, steam heating 135 E. 16th street, for the Doubleday Publishing Co.

Robert J. Walker & Son, 2149 E. York street, Philadelphia, steam heating large department store, Front and York streets.

William M. Gaige, 968 St. Nicholas avenue, New York, heating apartment house, corner Lenox avenue and 139th street.

Walker & Chambers, 50 E. 20th street, New York, heating school at Bleecker and Ralph streets, Brooklyn.

Blake & Williams, 211 W. 20th street, New York, steam heating loft building, 127-31 Fourth avenue.

James Corcoran Mfg. Co., 512 W. 36th street, New York, heating St. Raphael's R. C. church, W. 41st street and Tenth avenue.

C. P. McKnight, 241 W. 125th street, New York, heating hotel, 70-74 W. 59th street.

Alexander Duncan Co., Boston, overhauling the heating and ventilating system in the Roger Wolcott school house.

NATIONAL TRADE MAILING LISTS

PLUMBERS, STEAMFITTERS
MANUFACTURERS, JOBBERS
ARCHITECTS, CONSULTING
ENGINEERS

I. WILSON

630 MOHAWK BUILDING
NEW YORK

THOMAS S. CRANE

70 Nassau St. (Room 40) NEW YORK
Telephone, 784 John

Patent Expert and Solicitor

A. MUGFORD
Engraver AND Electrotyper
ILLUSTRATIONS OF HEATING SYSTEMS A SPECIALTY.
NEW YORK · HARTFORD · BOSTON

STARBUCK'S NEW TIME CARDS

For Heating and Plumbing Work

These cards are printed in duplicate and consecutively. The card is given to the workman and the stub left in the office so that no charges can be forgotten. On the back of the card is space for list of stock used.

Price, $4.00; with firm name, $1.00 extra.

Heating and Ventilating Magazine
1123 BROADWAY, CITY

Hot Water Circulation
ILLUSTRATED

Fifty blue prints bound, showing range boiler connections and hot water circulation under all possible conditions; full notes and practical suggestions; the result of 35 years' experience. - - - - - - - Price, $3.00

New York Plumbing Co., Council Bluffs, Ia., heating Avenue B school.

Barlow Bros., Waterbury, Conn., heating and ventilating Bank street school.

G. E. Sheerer, Cedar Falls, Ia., steam heating Butler county court house.

Bradley & Chatman, Boston, heating O. H. Story's residence, Chestnut Hill.

Winona Heating & Ventilating Co., Winona, Minn., heating four cottages for C. H. Beyerstede.

G. E. Sheerer, Cedar Falls, Ia., steam heating court house.

Lewis & Kitchen, Topeka, Kas., heating manual training school and High school.

F. K. Van Court & Son, 406 W. 42d street, New York, steam heating store and loft building, 141-143 W. 26th street.

Sayles Co., 446 Fourth avenue, New York, steam heating two large buildings, 45th street and Broadway.

Walker & Pratt Mfg. Co., Boston, heating private library and art gallery, 35-37 E. 36th street, New York, for J. Pierpont Morgan.

Gillis & Geoghegan, 639 W. Broadway, New York, steam heating factory, 543 W. 23d street.

Edward Thompson, 1603 Sansom street, Philadelphia, Pa., steam heating Dr. Mitchell's residence, 1603 Spruce street.

H. Lehman, 72 W. 98th street, New York, steam heating flat building, 1 W. 114th street.

Francis Bros. & Jellett, New York, steam heating 38 E. 40th street.

E. Rutzler, 178 Centre street, New York, steam heating public school No. 145, Brooklyn.

F. F. MacNichol, Oshkosh, Wis., steam heating large double store building at Waupaca.

E. M. Osmun & Son, Washington, N. J., plumbing and heating residence of Winthrop, Rutherford, Allamuchy.

Schroeder & Bremmer, Yankton, S. D., heating city hall and library at Mitchell.

H. Goldfein & Son, Cleveland, O., plumbing and heating power building at Broadway and Cross streets.

Dlugosch & Rinehart, Storm Lake, Ia., plumbing and hot water heating T. G. White's residence, Guttenberg.

Barlow Bros. Co., Waterbury, Conn., plumbing and heating A. I. Chatfield's residence.

Huey Bros., Boston, heating and ventilating High school, Brockton.

James J. Lynch & Co., Newport, R. I., heating and ventilating High school.

A. L. Hobbs, Raton, N. M., steam heating Seabery block.

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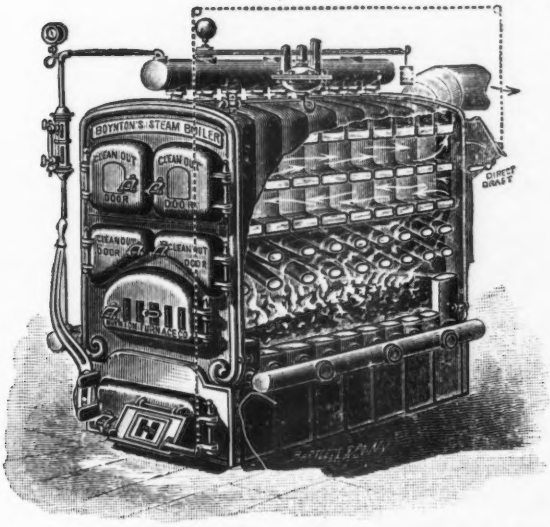

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Gaige & Co., 160th street and Amsterdam avenue, New York city, heating apartments, 160th street near Melrose avenue; heating Municipal Court stores, Amsterdam avenue and 126th street.

O'Neill & Curtin, West Haven, Conn., heating the residence of G. W. Hemingway.

Chatfield & Armitage, Jamestown, N. Y., heating the M. E. church, Ridgeway, Pa.

Walker & Chambers, 50 E. 20th street, heating warehouse of Varick Realty Co., Hubert and West streets.

Rossman & Bracken, 138 East 42d street, New York, heating public bath house in Brooklyn.

James Curran Mfg. Co., heating Public School No. 28, College Point, N. Y.

A. C. Edgar, 18 S. Seventh street, Philadelphia, heating sixteen residences on 18th street.

S. Faith & Co., 2427 Pennsylvania avenue, Philadelphia, steam heating Toronto Carpet Works factory. Toronto, Ontario.

James Curram Mfg. Co., 512 W. 36th street, New York, heating addition to Grand Hotel.

L. G. Kirk, 419 Lexington avenue, New York, heating 6-story building, Sixth avenue and 26th street.

United Heating Co., 174 Wooster street, New York, high and low pressure work for the Imperial Turkish Baths, 1263 Broadway.

Smith & McNeil, Port Chester, N. Y., heating by indirect steam R. R. Colgate's residence, Sharon, Conn.

S. Faith & Co., 2427 Pennsylvania avenue, Philadelphia, heating by steam Geo. Eastman's residence, Rochester, N. Y.

Roberts Leineau, 111 S. Seventh street, Philadelphia, heating the Weimer Building, Arch street, Philadelphia.

W. A. Lawson, Newark, N. J., heating Wm. H. Sears' residence, Bloomfield; heating double flats, Van Buren and East Kinney streets, Newark.

Robert Zeitler, Newark, N. J., heating two-family residence, North 5th street.

Edward M. Cleveland, Hackensack, N. J., heating Dr. Henry McDonnell residence.

James T. McNab, Paterson, N. J., heating store and apartments, 92 Ellison street.

W. Al. Lafin & Co., 333 Hudson street, New York city, heating William Barclay Parson's residence, 35 East 50th street.

Victor Heating Co., 2295 Broadway, New York, heating DeWitt court apartment house, W. 82d street, near Broadway.

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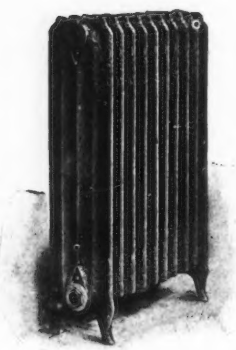

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James A. Flynn, 13th and Sansom streets, Philadelphia, heating St. Joseph's Hospital.

Hoben & Doyle, Pine and 21st streets, Philadelphia, heating new public building at Norristown, Pa.

David Craig, Boston, heating residence of Mathew Luce, Cohassett, Mass.

Anderson-Darrah Co., Ltd., 210 Market street, Pittsburg, Pa., heating East End Hospital.

Flowers & Co., Linden street, E. Pittsburg, heating East Pittsburg Beneficial Hall.

Samuel Leek, McKeesport, Pa., overhauling heating system at the East End Building.

Saunders & Foot, Columbus, O., heating building at Denison University.

Frank Dobson, 218 E. 42d street, New York, heating large arcade on Lexington avenue, for Bloomfield Bros.

Bellamy & Hornung, Lincoln, Neb., heating, ventilating and plumbing the Monmouth Park Building.

The Pond & Hasey Co., Minneapolis, Minn., heating the Adams School, Calhoun School and Motley School.

H. Kelly & Co., Minneapolis, Minn., heating Clay School.

Richard T. Ford & Co., Rochester, N. Y., heating the tuberculosis pavillion of the Ogdensburg State Hospital; heating the Oneonta State Armory; heating the Gloversville State Armory.

The Buffalo Forge Co., Buffalo, N. Y., are building a drying outfit for the American Smokeless Powder Company, Boston, Mass.; heating and ventilating apparatus for the Third Baptist church, St. Louis, Mo.; equipment for the Lehigh Valley Railroad power houses at Sayra, Pa., consisting of two 190-inch fans with direct connected cross compound engines. For the Manual Training High School at Louisville, Ky., they are getting out a complete forge shop equipment for 47 fires; also a mine ventilating fan for the Consolidated Coal Co., Baltimore; complete heating and ventilating plant and induced draft apparatus for the Issaquenna Cotton Mills, Central, S. C. For export they have orders in hand for two large forced draft fans for the Tokio Street Railway, Tokio, Japan; several drying outfits for the Excelsior & Phoenix Fire Resisting Plates Company, Palmerston, England, and a number of special drying outfits for the Nobles Explosives Company, Ltd., England.

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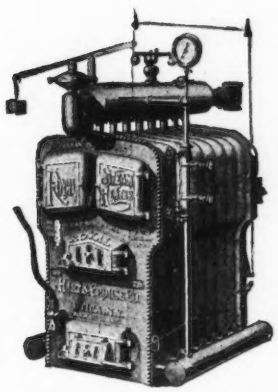

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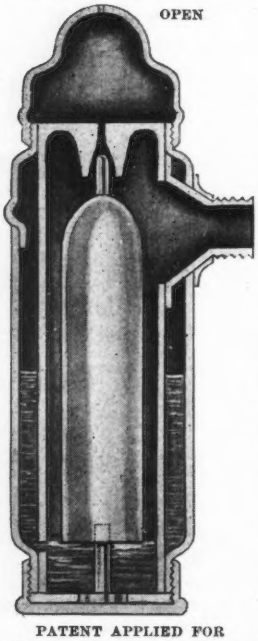

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